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Tech Notes

For Diemaking and Diecutting

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“The ABC’s of Implementing Fast Press Changeover using the SMED Discipline.”

This training guide is a pictorial, step-by-step training program, which is designed to form a plan-of-action to achieve and to sustain Fast Press Changeover, and Optimal Productive Output in Platen Diecutting.

The program consists of a series of key disciplines and important recommendations, which can be implemented in the recommended sequence, they can be developed as one-off projects, and they can be customized and mixed and matched to meet your specific needs. In practice, rather than over-burden the work team by attempting too much to quickly, it is far more effective to break the improvement program down into small projects, which can be started, managed, and integrated into daily activity with minimal disruption. Start slow, start small, but keep going. Every step you take in the right direction will make the operation more efficient, more effective, and more productive.

This is not just about productive improvement in diecutting but it is about reducing complexity, making the process simpler to execute and easier to learn, and in substantially reducing the stress and the frustration of sustaining high speed converting.

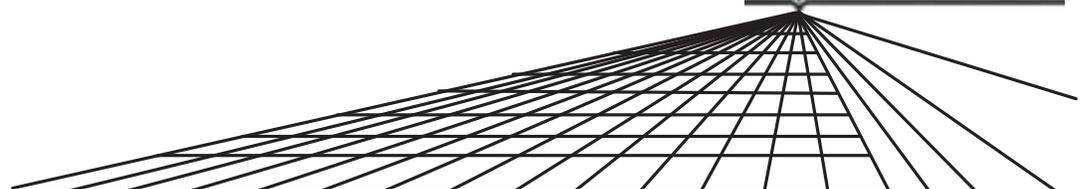
In an international marketplace it is vital to create a World Class, low operating cost process, which achieves profitability through speed to market and consistent fast turnaround performance. This is the foundation plan for this objective.

The best source for the knowledge, for the experience, for the resources, and for the technical discussion of subjects like this is the International Association of Diemaking and Diecutting.

Call 1-800-828-4233



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“The ABC’s of Implementing Fast Press Changeover using the SMED Discipline.”



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The ABC's of Diemaking & Diecutting

Article Title "The ABC's of Implementing Fast Press Changeover using the SMED Discipline."

Introduction

"It is better to light a candle than curse the darkness." Chinese Proverb

It is obvious there is intense competition in the Converting Industry. This is driven by over capacity, by competitive innovation, by speed of response, by the quality and the consistency of output, by economic fluctuation, and by the cost of manufacturing. Companies are striving to create a world class manufacturing organization, which is equally adept at competing regionally, nationally, and internationally. The over riding *mission statement of an effective manufacturing organization is Safety, Speed, Quality, and Cost, with the accent on Speed!*



To achieve and sustain exceptional productive performance demands an effective, an innovative, and well-organized operation, driven by a motivated team of technically gifted individuals who are accurately aligned with company goals and aspirations. To create an effective and an efficient process improvement program for Fast Press Changeover, it is vital to gather all the resources we have available, and to rapidly develop a consensus plan of action.

The commercial-strategic requirement is simple and direct. Our mission is to reorganize the current system of manufacturing to transform diecutting press changeover into a fast, a consistent and an effective discipline. We already have a system of manufacturing in place. However, it is not achieving the potential it is capable of.

In any project, the primary goal is to create and develop an effective team. With a genuine team effort, everything is possible. The stronger the commitment to teamwork, the faster the work teams will learn, the more rapidly they will develop, and the more likely they are to succeed. It is however, important to remember in any activity, building a unified and a focused team is both the most difficult



and the most important of tasks.

With a good team foundation in place, knowledge, skill, and experience are secondary to a positive attitude. In this project, it is essential to put teamwork and team building first. To build success, it is essential to devote time and resources to ensure collaboration, cooperation and communication between every member of the team.

Once the team is in place the logical question is, what is the most effective approach to organizing consistent fast press changeover from job to job to job? The answer is to adopt the most successful changeover improvement system ever practiced, *Single Minute Exchange of Die, or SMED.*

This training article outlines the key principles of SMED and the vital disciplines, which are essential to make the program successful.

Single Minute Exchange of Die: Overview

"As a rule initiative in an organization should be pushed down to the lowest level where decision can be made, through instilling a desire to excel at every level." George S. Odiorne

Single Minute Exchange of Die (SMED) is one of the most successful lean production methods for reducing waste in a manufacturing process. It provides a rapid and efficient way of changing over a manufacturing process from running the current production run,



to running the next production run. It is also often referred to as *Quick Changeover*. It is a concept that says all changeovers can and should take less than 10 minutes ... hence the phrase Single Minute. Closely associated is an advanced concept of "*One-Touch Exchange of Die*", which says changeovers can and should take less than 100 seconds for each tool set.

There are a number of other key organization con-





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"Many ideas grow better when transplanted into another mind than in the one where they sprung up." Oliver Wendell Holmes

cepts integrated into this discipline, including **"One-Touch Processing,"** which means the tool is only touched during changeover in installation and in deinstallation. (And why do we see it as necessary or even acceptable to work on tools on press?)

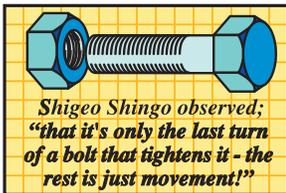
THE S.M.E.D. PROCESS

There are Seven basic steps in the SMED system:

1. Observe current Methods
2. Separate Internal & External activity.
3. Convert Internal activity to External activity.
4. Streamline the remaining Internal activities, by simplifying them.
5. Streamline the External activities, by simplifying them.
6. Document & teach the new procedure.
7. Do it all again!

sity in order to achieve Just-In-Time production, a cornerstone of effective manufacturing. This system was developed to cut set-up times, enabling smaller batch sizes to be produced. The set-up procedures were simplified by using common or similar set-up elements whenever possible.

The second important principle is **"Mistake Proofing."** This reflects an effort made in advance of a process to make it impossible, or very difficult, to do something in a wrong manner, or to use a tool in an incorrect manner. One of the best-known examples of Mistake Proofing, is the inability to remove a car key from the ignition switch of an automobile, if the transmission is not first put in the **"Park,"** so that the driver is unable to leave the car



in an unsafe parking condition, where the wheels are not locked against movement.

Many of these concepts and fast changeover practices were developed and fine tuned by the late Dr. Shigeo Shingo,

who was a very successful industrial engineer in the Japanese manufacturing revolution after the second world war, where he played a key role in revolutionizing the way we all manufacture goods.

Shingo was born in Japan in 1909, and graduated in Mechanical Engineering in 1930. In 1955 he took charge of industrial engineering and factory improvement training at Toyota for both its employees and parts suppliers. During the period 1956-58 at Mitsubishi, Shingo was responsible for reducing the time for hull assembly of a super-tanker from 4 months to 2 months. This established a new world record in shipbuilding, and the system spread to every shipyard in Japan.

In terms of quality, Shingo's paramount contribution was his development in the 1960s of poka-yoke (mistake proofing) and source inspection systems. In 1970 he originated the SMED System (Single Minute Exchange of Die), which is part of the Just in Time system. The SMED system was born out of neces-



This approach was in complete contrast with traditional manufacturing procedures, as Shingo pointed out: **"It is generally and erroneously believed, that the most effective policies for dealing with set-ups address the problem in terms of skill. Although many companies have set up policies designed to raise the skill level of the workers, few have implemented strategies that lower the skill level required by the set-up itself."**

Single Minute Exchange of Die, Mistake Proofing, and One Touch Processing, are practices, which have generated great success in every different type of manufacturing process, including diecutting.

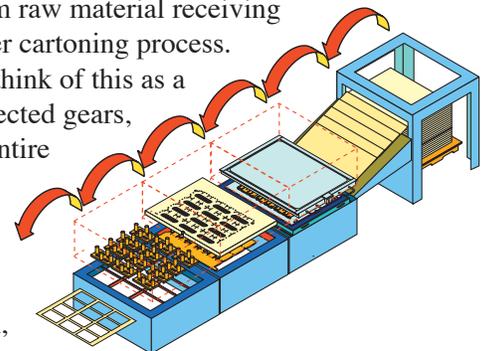
What is High Speed, Sheet Fed Diecutting?

"You can't wait for inspiration. You have to go after it with a club." Jack London

The challenge of fast press changeover, begins by developing a clear understanding of the critical operating principles of high speed sheet fed diecutting, and to gain an appreciation of how the performance of diecutting impacts the performance of the entire converting operation. There are several concepts we can define, which should impact our approach to the process.

First, the diecutting operation is an integral and interconnected part of an unbroken production line stretching from raw material receiving to the customer cartoning process.

It is useful to think of this as a series of connected gears, in which the entire mechanism is reliant on the timing, the speed and the integration,



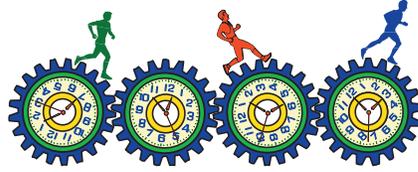


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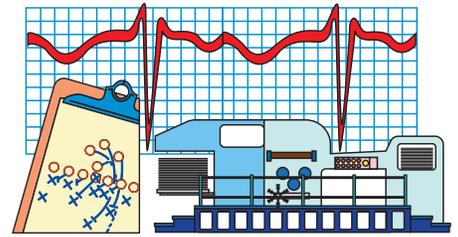
"A person who can create ideas worthy of note is a person who has learned much from others." Konosuke Matsushita

with every other gear.

Second, it is important to recognize that although the diecutting machine is an in-line series of sequential, individual and distinct processes, their synchronization, and the transportation of materials from one stage to the next is the Achilles Heel of production speed and yield. Work-in-process, in the form of a sheet of paperboard, and then a loose collection of diecut parts, flows through an interconnected series of activities from one press unit to the next. (*First, Transported in, Second, Registered, Third, Processed, Fourth, Transported out, and Fifth, registered in the next male and female tool unit.*) How is this key discipline



unpredictable performance of diecutting maker-ready and production output is a constant bottleneck severely undermining the efficient work flow of the operation.

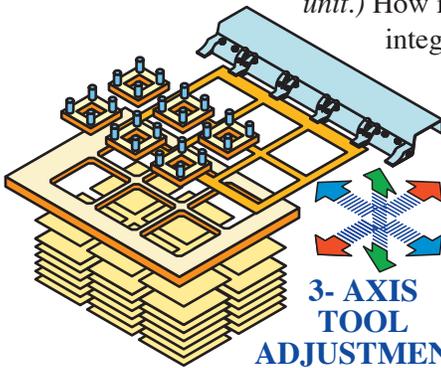


Changeover Performance?

It is not just the problems with the flow or the throughput of work but it is the unpredictability and uncertainty of the outcome that throws production control off course. The primary bottleneck is Press Make-Ready, therefore, the first goal is to establish consistent and reliable performance benchmarks for job set-up and changeover. To develop a consistent approach requires developing the most effective methods and practices.

Manufacturing is about research, as we continuously search for better ways to do things. The need to establish a current benchmark demands that we first focus on changeover, and develop a series of procedures, which minimize make-ready time, which maximize output and yield, and which deliver exceptional converting quality and repeatability.

Press changeover is the engine room of the diecutting process, and to maximize power and performance we have to standardize, to benchmark, to simplify, to upgrade procedures, and then repeat, and repeat, and repeat this process! Single Minute Exchange of Die provides the framework, the tools, and the techniques to make this a practical reality.



3-AXIS TOOL ADJUSTMENT

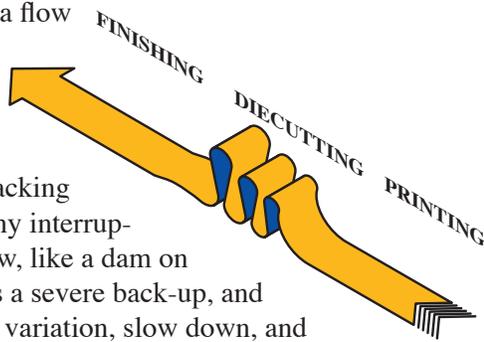
integrated into the specification, the design, and the fabrication of tools, and their preparation for on-press make-ready and production?

Third, the diecutter is merely a tool

holder, in which the tools are controlled and integrated by the press in three axis. Diecutting-converting is the result of a sheet or a web of material being trapped and compressed between a male and a female tool, and the quality and the speed of output is a function of the specification, the design and the fabrication of effective tools. Allowing tools to be touched on-press, other than to insert and position the tools, is a fundamental breakdown of effective manufacturing, which undermines every subsequent diecutting activity. Why are we finishing tools on-press?



Fourth, the interconnected production line processes, which make up a manufacturing operation are often referred to as a flow process. In this flow of materials, from material handling to packing and freight, any interruption of the flow, like a dam on a river, causes a severe back-up, and flooding! The variation, slow down, and



What are the Essential Disciplines of SMED?

"We judge ourselves by what we feel capable of doing, while others judge us by what we have done." Henry Wadsworth Longfellow

Single Minute Exchange of Die is a straightforward analytical and restructuring discipline, which when followed carefully and consistently, provides a logical step-by-step plan of action to improve set-up efficiency. However, implementation success is predicated on a well organized, a well disciplined,





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"What lies behind us and what lies before us are tiny matters compared to what lies within us." Ralph Waldo Emerson

and a team driven operation.

To ensure fast press changeover improvement and to sustain productive success it is vital to integrate the SMED procedure with the following fundamental manufacturing principles and practices.



one for all." Alexandre Dumas

As with the preeminent safety discipline, it is easy to underestimate the teambuilding process, where the perception is, it is either a simple way of working together which builds mutual success or it is a complex activity, which undermines independence and freedom.

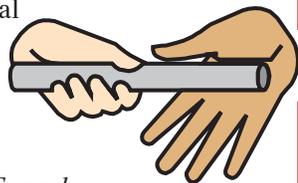
In reality we are all members of teams, whether we recognize it or not. As Lyndon Baines Johnson stated: "There are no problems we cannot solve together, and very few we can solve by ourselves."



- ✿ **Teamwork**
- ✿ **Standardization, Benchmarking & Simplification**
- ✿ **The Procedural Training System**
- ✿ **Key Result Analysis Measurement**
- ✿ **Information Management**
- ✿ **Inventory Management**
- ✿ **Just-In-Time Organization**
- ✿ **Time Management**
- ✿ **Parallel Processing**
- ✿ **One Touch Tooling**
- ✿ **Mistake Proofing**
- ✿ **System Maintenance**
- ✿ **Work Planning & Closing the Loop**



If you conducted a commercial, a technical and a changeover analysis of the top companies in your state, in your region, in your country, or internationally, where would you stand? Fast press changeover is the benchmark for World Class Converting Manufacturing, and to survive and to prosper in a global economy, the following disciplines are critical to performance success.



✿ **Teamwork**

Common Sense states that... To seek performance parity; to generate procedural uniformity; to combine all of the talents of all of the people all of the time; to use every production cycle to extract and to continuously upgrade and share the best ideas, the most effective solutions, and the most recent process innovation; to ensure a unity of purpose and alignment; and to build a team committed to a shared vision ... teams, teamwork and teambuilding are the foundation disciplines for success. "All for one and



Every organization, every company, every department, and every discipline in the converting manufacturing operation are de facto teams, whether effective and focused, or dysfunctional and disorganized. We are pulled inexorably together, no matter how well or how poorly we interact. When a customer considers your organization they would be horrified if they discovered this important supplier was not the seamless interaction of cooperating professionals you pretend to be!

An even more disturbing fact for isolationists, is your company and any type of business group consisting of people, is primarily a social organization, where personal relationships are the glue which builds our economic security.

In practice, team work and team organization are neither easy nor simple, and it is important to recognize and accept the challenge of building, sustaining, & leading teams to success. However, the current situation, in which every person does it differently, executes their own plan of action, and uses inconsistently applied methods and practices, is clearly the cause of our inability to manage changeover. To build a world class, efficient fast press changeover organization, we have to work well and we have to work together. But we have to be realistic.

TEAM BUILDING ISSUES	
01:	The Team Charter (Why are we forming this team?)
02:	The Team Values (How will we work together?)
03:	The Team Mission (What are we trying to achieve?)
04:	Team Measurement (How do we measure success?)
05:	Team Management (How do we get things done?)
06:	Team Procedures (How do we plan, execute, control & evaluate?)
07:	Team Decision Making (How do select the most effective option(s)?)
08:	Team Resources (How do we get the tools to do the job?)
09:	Team Benefits (How will completion improve our status?)
10:	Team Future (What happens when the project is complete?)





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"A decision is an action you must take when you have information so incomplete that the answer does not suggest itself." Arthur Radford



People are not the same. They hold different and strongly held ideas and attitudes; perceptions and prejudices; comfort levels and conflict zones; and likes and dislikes; all of which impact the way they behave, the way they react to change, and the way they communicate. However, even though in the short term, teamwork can be chaotic, we have little choice in this aggressive market but to work together for our survival.

The good news is, people want to succeed, but fear, habit, or peer pressure limit their potential. It is a rare individual who leaves the operation at the end of the day feeling good about his effort, when the day was a productive disaster. To repeat, people want to succeed! However, it is vital to integrate experienced team facilitators and coaches at the beginning of the project to overcome the lack of teamwork experience and the inevitable start-up issues. It is useful to consider this Daniel Webster quote; *"Man is a special being, and if left to himself, in an isolated condition, would be one of the weakest creatures; but associated with his kind, he works wonders."*

The benefits of changing to a team drive system of manufacturing include:

- The ability of teams to make extraordinary progress when combining their talent and ability to reach a shared vision.
- The ability of teams to educate, to teach, and to rapidly develop technical competence.
- The ability of teams to simplify and to standardize a more effective and a more efficient system of converting-manufacturing.
- The ability of teams to self-manage and to take responsibility for every facet of daily working.
- The ability of teams to create a positive work environment, which promotes safety, speed, quality, and low cost manufacturing.

This is a significant change to the way we currently work, and while the initial stages of



team building and team work appear challenging and complex, if the changeover is managed in a measured step-by-step fashion, the benefits of adopting this system of working are extraordinary.

The first step in taking action in this project is to invest in a team trainer and a team specialist, who can facilitate and lead the team building project. It is more effective if the person is not from your organization, and while some industry knowledge is a benefit, this person should not play any technical role in the project, but merely advise and coordinate team building and team activity.

Many of the steps and team building project actions have been specified, however to reiterate the important sequence of activity, the recommended actions are:

- The project and the initiative should be presented to the entire workforce by the manager of the department, with the full support of the entire company management team.
- The organization should contract with an experienced team trainer and facilitator.
- A Planning Team should be selected including the facilitator, the department manager, one or two workers from the department, and one representative from the internal supply department, one representative from the internal customer department, and any union representative appropriate to the diecutting-converting operation.
- The Planning Team should develop a provisional plan for the project and a vision statement to be presented to the work force.
- The manager, with the support of the owner/president, should present the plan to the entire workforce and solicit their assistance in finalizing the distributed provisional plan of action.
- A series of meetings should be scheduled between the workforce and the planning team to gather feedback, to answer questions, and to solicit suggestions to augment and improve the proposed program of change.
- The Planning Team assimilates all of the feedback,



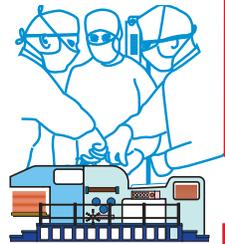


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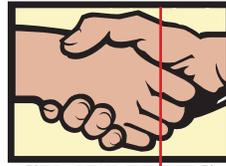
"Choose your rut carefully; you'll be in it for the next ten miles." Road Sign New York

suggestions and concerns, revises & re-distributes the updated plan of action.

- The initial teams are selected and training for the entire department is scheduled.
- A team name, nickname and a by-line is developed for each team, with a team logo.
- Team colors are selected and hats, t-shirts, jackets, and banners are provided bearing the team name, logo, and by-line.
- The Planning Team chooses projects to give the new teams time to adapt to the new system of working and to gain experience in the new way of working
- The creation of documented and consensus driven videotaped standard operating procedures for these selected projects is employed as the basis for building relationship and technical unity of purpose.
- Implement a regular team close out to discuss problems and issues, asking:
 - * *What is working well?*
 - * *What is less effective?*
 - * *What and how do we need to change?*
- Evaluate team performance and adapt the plan and schedule further training accordingly.
 - * *Leadership Training*
 - * *Resolving Disputes*
 - * *Meeting Management*
 - * *Planning & Organization*
- Take any and every opportunity to reward and publicly recognize achievement with inexpensive gifts, trophies & certificates.
- Celebrate any and all successes with Pizza, Cake & Cookies.



TEAMWORK



SIMPLIFIES

race against a relentless market driven production clock.

Therefore, it is important to plan with this in mind and to anticipate, to develop, and to communicate contingency actions to deal with inevitable delay and disruption.

* **Standardization, Benchmarking & Simplification**

*Common Sense states that... To find the safest, the simplest, and the most efficient ways to do things; to pare away superfluous steps, actions, tools and materials; to compete against a continuously upgraded time standard; to streamline activities, reduce complexity and lower skill requirements; demands a commitment to standardizing the current best operating procedure, requires setting time goals and benchmarks to assess performance progress, and streamlining, and to eliminate non-value added and wasteful activity... **Simpler, Faster, Better**, is the Mission for the work team.*

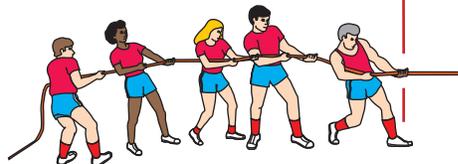
It is obviously important to standardize current procedures, but only as a preliminary benchmark for process simplification and the continuous paring away of superfluous steps, non-value added time, and excess cost. For example:

- *What is the point of creating standard operating procedures, when the organization in which they are performed, is not in itself standardized?*
- *What is the point of creating standard operating procedures, when many of the steps are repetitive duplication of unnecessary actions?*
- *What is the point of creating standard operating procedures, when the work areas are constantly changing, and are different every time?*

All these statements are true and reflect a deep seated problem in the way we structure and organize work areas. However, the creation of a Standard Operating Procedure should be re-defined as creating the Current Best Operating Procedure! This is necessary because although we create a benchmarked standard of the best of the best, now we have simply drawn a line in the sand or created a target we can compete against to find faster and simpler ways to do things.

For example, any important test of an improved process, is that it must require less effort, less resources,

As you can see from this recommended approach to creating an effective team driven system of converting manufacturing, the project should be implemented in a measured, steady, and unrelenting fashion. In principle, each step is simple and straightforward, however, the key challenge of this project is in integrating this project into and with the daily

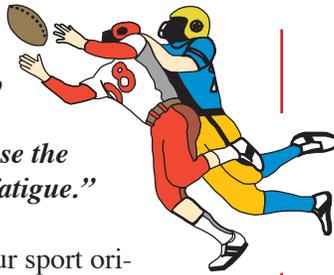




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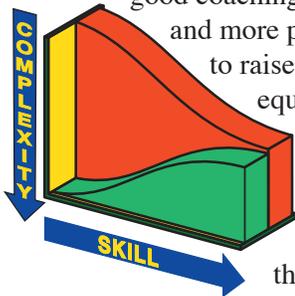
"Trust your own instinct. Your mistakes might as well be your own, instead of someone else's." Billy Wilder

and less time. This principle is fundamental to improvement as Charles Coulomb stated; ***"To obtain the most from a man's energy it is necessary to increase the effect, without increasing the fatigue."***



Practical examples abound in our sport oriented society. Leading athletes achieve greatness when they make seemingly impossible plays look incredible simple. This type of performance is achieved by continually repeating the play and paring away unnecessary movement, by eliminating excess poorly directed effort, by careful refinement of each step, and by conserving and directing the minimum amount of energy required for a specific outcome.

Naturally, outstanding performance is the result of good coaching integrated with practice, practice, and more practice! It is obviously important to raise knowledge and skill, but it is equally critical and no less effective to lower the bar! Reducing the complexity of any task cuts time, reduces cost, lowers fatigue, minimizes opportunity for error, limits the number of inspection steps, and it requires less training and skill development.



The solution to the problem of standardization, of simplification or streamlining, and of organizing an effective system of diecutting-converting, is to enact 6 important principles. Therefore, to build a foundation for changeover success it is vital that ...

- ➔ ***Everything required for completing an effective diecutting-converting production cycle, must be standardized, without exception.***
- ➔ ***Every work area must be designated, defined, mapped, and organized, using value-added and non-value added time as the organizing principle.***
- ➔ ***Everything used in diecutting-converting must have an identification code, a designated storage location, and an inventory management discipline if it is a consumable item.***
- ➔ ***Every tool, material, supply, part, component, equipment and technical data must be identified, approved and certified.***
- ➔ ***Every production cycle must begin with pre-***

production verification using a preparatory checklist to ensure readiness, and every production cycle, must include a close-out, work area purge and replenishing discipline.

➔ ***Every activity performed in diecutting-converting must be defined, standardized, sequenced, measured and benchmarked.***

As you read and review these key principles you can see we are laying the groundwork for the introduction of Time Management, of Just-in-Time Principles, of Single Minute Exchange of Die, and Inventory Management disciplines.

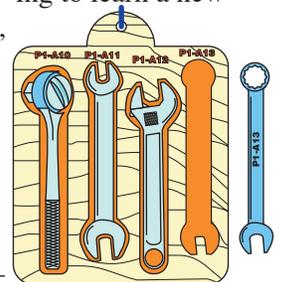
"In the first round of work simplification ... you can reasonably expect a 30 to 50% reduction. To implement the actual simplification, you must question why each step is performed. Typically, you will find that many steps exist in your work flow for no good reason. Often they are there by tradition or because formal procedure demands it, and nothing practical ordains it."



In practice, if you enacted and implemented the six disciplines described, the majority of performance problems you currently face would be eliminated. For example...

If you were attempting to learn a new

process, which, would be easier, a procedure with 15 steps, one with 10 steps, or one with 5 steps? Clearly, the one with 5 steps.



If you could choose between a work area in which, every material was stored in a single source, color coded location, every tool was positioned next to where it would be used, in a shadow box format, or tools were duplicated in each location, or you could work in an ill-defined area in which tools, materials and components were randomly positioned, which would you choose? If you could choose between carrying materials 100 paces to complete a project or carrying materials 50 paces, which would you choose?

It is vital to standardize everything, to ensure we are working in the safest, the most efficient and the most effective manner. It is vital to streamline our activity to so well organized, our work areas and our activity, that unnecessary steps or





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"The meaning of things lies not in the things themselves, but in our attitude towards them." Antoine de Saint-Exupery



*"Life is not complex. We are complex. Life is simple, and the simple thing is the right thing."
Oscar Wilde*

actions are eliminated or combined.

It is vital to simplify the process, by positioning things where they are needed, by having color coded storage locations for everything we use, and by following a consistently executed sequence of procedures.

Our goal is certainly to improve productivity and quality, speed and yield, but by standardizing, by streamlining, and by simplifying, we are reducing fatigue, we are lowering stress, we are making the workplace safer, and we are creating **systems** of diecutting-converting, which will be simpler, faster, and better.

As with all of the initiatives contained in this article it is sensible to avoid changing everything, but to select one area and one activity to standardize and streamline.



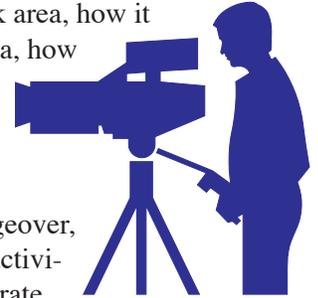
Therefore, the **first step** should be to define each separate or integrated work area, and list the activities which are performed in these areas. The **second step** is to select the work area or work cell which is going to be our test bed. The **third step**, after choosing the area to be processed, is to list and give an identity code to every tool, material, supply, part, component, and piece of equipment which is in the area, or which is moved into the area during the activity we are focused upon.

The **fourth step** is to map the area at a specific scale, choosing a ratio which is easy to work with, 1/4" to the foot for example, and then create the layout in the CAD system.

The **fifth step** is to layout all of the permanent equipment in the area and produce scale drawings of the temporary equipment used in the area.

The **sixth step** is to map how every item reaches the work area, where it is positioned in the department or the com-

pany, how it gets to the work area, how it is positioned in the work area, how it is used in the work area, and how it is returned to its original storage location.



A videotape of a press changeover, when combined with these activities, will inevitably demonstrate either an unusual, precise and wonderful system of organization, or the more normal inconsistent, chaotic and inefficient, and extremely varied approach to task completion. It may be useful to teach the work teams basic flowcharting as an excellent tool for work analysis and for subsequent procedural changes.

Clearly, this initiative is clearing the ground for the more intense Just-In-Time organization, the critically important SMED discipline, and the essential Inventory Management controls.

* The Procedural Training System

Common Sense states that... the establishment of current best operating benchmark standards only become standards when the entire work team is proficient in the execution of that standard. Therefore, approved standard operating procedures become the basis for all training and skill development. A standard operating procedure is in practice a discrete training module, therefore the creation and continual improvement of standardized procedures is the creation of a training

and skill development program, which is always up-to-date. The Procedural Training Map integrates teamwork, standardization and benchmarking and training.

Many managers are concerned about the training dilemma they face. Whilst all recognize the necessity of improving the knowledge and the skill of the workforce, the apparent complexity of designing, implementing and managing an effective training program represents a complex challenge.

The Job Description/Structure

01	A Job Description <i>(What has to be done)</i>
02	A Work Structure <i>(How these activities are executed)</i>
03	Work Planning Guidelines <i>(Daily planning & organizing)</i>
04	Operating Procedures <i>(How these activities are performed consistently)</i>
05	Goal Setting <i>(Systematic improvement objectives)</i>
06	Measurement Criteria <i>(How performance will be measured)</i>
07	Problem Solving <i>(Trouble shooting & contingency procedures)</i>
08	Improvement & Innovation <i>(Individual & team development goals)</i>
09	Reporting Structure <i>(How information is collected & used)</i>
10	Appraisal Process <i>(How & when the position will be evaluated)</i>

Make it as Simple as Possible!





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"Each day can be one of triumph if you keep up your interests." George Matthew Adams

With no neatly packaged solutions available, coupled with limited time and resources, and ever present cost constraints, the frustrating cycle of inconsistent performance, seems an insurmountable barrier to productive improvement.

In reality, we have a system of training in-place! And however imperfect and how poorly organized, it does enable the departments to function at a basic level. The primary problem with the existing skill development programs is they are poorly documented, they are inconsistently executed, they produce unpredictable results, and the resulting performance is difficult to manage and impossible to reliably control.



To repeat we have a training system in place, which produces good results more often than not. However, we need to standardize, we need to stabilize,

and we need to establish benchmarked practices and procedures which represent the best ideas of everyone involved in the work team.

The following quotation is critical because it is such an important principle of effective manufacturing. It states, the goal is; "To get everyone to know, what everyone already knows!"

If we can accomplish this more even distribution of competence, we will have stabilized the current system of manufacturing, we will have built a foundation of consistent execution, upon which we can steadily get better. In seeking to continually upgrade methods, practices, and performance, it is essential we gain all of the knowledge and the experience we can from every production cycle. And, to make

Training is:

Behavior Modification

and/or

Behavior Development

To make something a habit, do it;
To not make it a habit, do not do it;
To unmake a habit, do something else in place of it.

sure we do not end up where we currently are, we need to ensure there is an ongoing daily consolidation of knowledge, ideas, and solutions, between everyone involved in each key process.

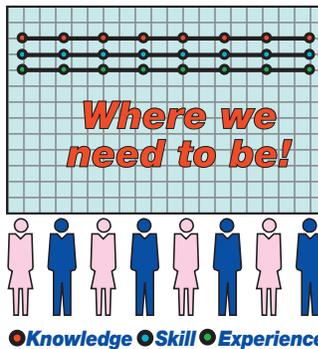
We need to standardize, we need to stabilize, and then we need to aggressively seek daily step-by-step improvement.

The majority of the knowledge, the skill,

and the experience we need to be a World Class organization is already in place, we just need a better way of focusing it. As Thomas Mann stated; "Order and simplification are the first steps toward mastery of a subject--the actual enemy is the unknown."



It is obvious we are facing a radical change in the way we do things. However, if we adopt a plan of action, which reflects the reality of the daily race against the clock, and which builds a team approach to manufacturing, we are more likely to succeed. So let us begin!



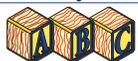
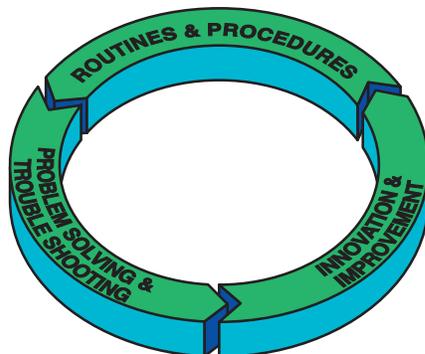
STEP 01: Selecting the Project Leader

Do we need a dedicated project leader?

Designing each team structure, selecting teams, choosing team roles, developing an effective operating structure, managing and scheduling team activities, and resolving all of the inevitable early problems, requires the assistance of someone who is experienced in the field. From problem solving to brainstorming, to organizing and holding successful meetings, to keeping everyone up-to-date and resolving disputes, is a full time job.

Therefore, we need to select a Project Leader or a Facilitator, who will plan, organize and guide the work teams through the implementation of this program.

THE STRUCTURE OF WORK





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"And each man stands with his face in the light of his own drawn sword. Ready to do what a hero can." Browning

STEP 02: Forming Work Teams

To achieve sustained productive improvement, we have to break through established behavioral patterns, we have to eliminate barriers to communication and the seamless flow of ideas, we have to encourage people to take greater responsibility, we have to persuade everyone to base their success on the success of their colleagues, and obviously level the knowledge, the skill, and the experience playing field.

Teamwork is the most effective tool to achieve all of these things and to surmount many related challenges as we develop a new system of working.

We must form (effective) teams!

STEP 03: Company Wide Communication

This project represents a fundamental change to the way we do things, so it is not just important to inform

Team Member Skills	
✓	Problem Solving
✓	Meeting Participation
✓	Communication
✓	Brainstorming
✓	Making Team Decisions
✓	Resolving Conflicts
✓	Selecting & Evaluation Options
✓	Making Presentations
✓	Organization
✓	Leadership

the work team impacted by the new system, but everyone in the organization.

In addition, all of the management team, and the supervisors and senior managers should attend this meeting to demonstrate the unequivocal

support for the project.

STEP 04: Analyze the Process

The **FIRST** Step in creating an effective training system is to break the process down into the major functions or areas of activity. These could be:

- ➔ Work Planning
- ➔ Production Toolmaking
- ➔ Pre-Make-Ready

Why are Work Teams so Effective?

- ◆ Team dynamics generate & accelerate problem solving, innovation, and process improvement initiatives
- ◆ The team interactive focus improves the communication and feedback of information
- ◆ The team approach simplifies and speeds up completion of complex, sequential, labor intensive tasks
- ◆ Teams are the most effective environment in which to build confidence, competence, and performance parity
- ◆ The mutually supportive competitive focus develops procedural consistency
- ◆ The team structure breaks down barriers and reinforces and sustains productive relationships

- ➔ Press Changeover
- ➔ Diecutting Production
- ➔ Diecutting Quality Management

The **SECOND** step is to prioritize and analyze each function into primary areas of expertise. For example, in toolmaking this would include, diemaking, stripping, blanking, ejection, nicking, etc.

The **THIRD** step is to define and identify all the disciplines within each function that can be defined as separate activities, with a well defined start and completion. These should be defined as Standard Operating Procedures.

The **FOURTH** step is to define and specify the specific employee roles within each function. These could include:

- ➔ Diemaker.
- ➔ Pre-Press Technician.
- ➔ Changeover Technician.
- ➔ Press Operator.
- ➔ Press Assistant.

The **FIFTH** step is to select a format for collecting and organizing the steps, the description of each step, and the benchmark time standard for each procedure.

The standard operating procedure format is illustrated below.

Standard Operating Procedure				PLATEN DIECUTTING: PRESS FOOTPRINTING											
SOP #:	04-05	Version #:	04-2	Department:	Pre-Press & Diecutting	Discipline:	Press Make-Ready	Page #	4-1						
Inception Date?	22-04-05	Update?	11-09-05	Approved by?	Ron	Trainee?	TLC	Trainer?	RCS	Training Date?	June 05				
Step	Action	Comments	Safety	Speed	Quality	Activity Time	Elapsed Time		Cost:						
1	Position the paper, squarely on the cutting plate, aligned with the leading edge of the plate, and tape securely.	Tape corners only, of the new Press Mapping Sheet, to create a flat taught sheet.	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	03 Minutes	03 Minutes	\$75	\$75						
2	Position a sheet of carbon paper, face down on the paper, completely covering the sheet.	Use 0.005" Bar-Plate Carbon Paper	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	03 Minutes	06 Minutes	\$75	\$150						
3	Using previously recorded pressure, gradually increase press tonnage, until the knives begin marking the patch-up sheet.	Keep a Pressure Record for every setting in the footprinting sequence	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	05 Minutes	11 Minutes	\$125	\$275						
4	Mark the Outer Impression Perimeter or Outer Layer of the first pressure level.	Use a Black Felt Marker to mark the first Pressure Layer	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	07 Minutes	18 Minutes	\$175	\$450						
5	Increase pressure slightly, record the pressure setting and take a second impression	Make a note of the pressure setting, and add the setting to the Press Mapping Sheet.	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	02 Minutes	20 Minutes	\$50	\$500						
6	Using a different colored Marker, outline the second pressure layer.	Use a Red Felt Marker to mark the second pressure layer.	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	Team Alpha ✓ Team One ✓	03 Minutes	23 Minutes	\$75	\$575						





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"One should count each day a separate life." Marcus Annaeus Seneca

Job Position	PRESS ASSISTANT					PRESS OPERATOR										PRE-PRESS OPER							
	Task Category					General Duties		Pre-Press		Press/Area		Purge		Changeover		Pre-Make-Ready							
STANDARD OPERATING PROCEDURE	Pre-press	Press	Area	Purge	Changeover	Pre-Make-Ready	General	Duties	Pre-Press	Press	Area	Purge	Changeover	Pre-Make-Ready	General	Duties	Pre-Press	Press	Area	Purge	Changeover	Pre-Make-Ready	
John Smith																							
Mary Jones																							
Susan Anthony																							
Peter Carew																							
Julio Sanchez																							
Angela Green																							
Andrew Barry																							
Teresa Brandon																							
Miguel Garcia																							
Steven Roberts																							
Warren James																							
Margaret Devon																							
Philip O'Tool																							
Miguel Gonzalez																							
Jim Webb																							
Ray Webber																							
Keith Richards																							
Christine Rhodes																							
Julio Herrera																							

Stage 1 Not Trained
 Stage 2 Partially Trained
 Stage 3 Fully Trained
 Stage 4 Performance Proven

STEP 05: The Training Map

The Training Map derives its name from the manner in which the entire knowledge and skill development program for every team member, is integrated into a single chart for every personnel classification. See the illustration on the next page.

In practice, in many operations, there is a logical training and promotion progression from press assistant to pre-press technician, to press operator, and therefore, the entire employee progression can be incorporated into a single management chart.

The chart should begin on the top left hand side, with the most basic procedures a novice would begin to learn, and progress from left to right across the chart, with increasingly more difficult tasks/procedures, to enable the creation of the training grid.

The grid is used to classify the training status of each team member in four ways:

Stage 1: Not Trained

When a grid cell is not marked in any way this simply designates the trainee has not received any formal training in the specific discipline or

procedure.

Stage 2: Partially Trained

The grid is marked with a single diagonal line, which indicates the trainee has undergone formal training to develop the skills in the specific procedure, but has not had sufficient time to perfect the task behavior.

Stage 3: Fully Trained

If the grid is marked with two diagonal lines, which indicates the trainee has undergone formal training, and has had sufficient time and assistance to develop the behavior, and complete the task a number of times without supervision, the trainee is considered to have been trained in the specific discipline.

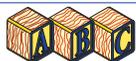
Stage 4: Performance Proven

This final classification is marked with a vertical line added to the two diagonal lines. This indicates the trainee has undergone a supervised analysis of his or her performance by one of his or her peers, and the trainee demonstrated a level of competence considered acceptable.

Performance Qualification

This simple but pragmatic approach to performance assessment is structured around the creation of standard operating procedures. These important tools, task guidelines and performance benchmarks are the foundation of a productive operation.

TASK PERFORMANCE EVALUATION: PROCEDURE: Leveling The Impression											
Trainee:	Evaluator: _____ Date: _____										
STEP 1 Calculate the preliminary tonnage adjustment from the job format, job history, and press characteristics	<table border="1"> <tr> <th>UNSATISFACTORY</th> <th>MARGINAL</th> <th>GOOD</th> <th>VERY GOOD</th> <th>EXCELLENT</th> </tr> <tr> <td>1 2 3 4 5 6 7 8 9 10</td> <td>11 12 13 14 15 16</td> <td>17 18 19 20 21</td> <td>22 23 24 25</td> <td></td> </tr> </table> Comments/Suggestions	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT	1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25	
	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT						
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25								
STEP 2 Set the preliminary tonnage and take a single sheet impression	<table border="1"> <tr> <th>UNSATISFACTORY</th> <th>MARGINAL</th> <th>GOOD</th> <th>VERY GOOD</th> <th>EXCELLENT</th> </tr> <tr> <td>1 2 3 4 5 6 7 8 9 10</td> <td>11 12 13 14 15 16</td> <td>17 18 19 20 21</td> <td>22 23 24 25</td> <td></td> </tr> </table> Comments/Suggestions	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT	1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25	
	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT						
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25								
STEP 3 Examine the back, and the front of the diecut sheet for full penetration, and pressure variation, and mark the low areas.	<table border="1"> <tr> <th>UNSATISFACTORY</th> <th>MARGINAL</th> <th>GOOD</th> <th>VERY GOOD</th> <th>EXCELLENT</th> </tr> <tr> <td>1 2 3 4 5 6 7 8 9 10</td> <td>11 12 13 14 15 16</td> <td>17 18 19 20 21</td> <td>22 23 24 25</td> <td></td> </tr> </table> Comments/Suggestions	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT	1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25	
	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	EXCELLENT						
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19 20 21	22 23 24 25								
STEP 4 Select appropriate area patch-up material and tea to the shape(s) of the low pressure areas.	<table border="1"> <tr> <th>UNSATISFACTORY</th> <th>MARGINAL</th> <th>GOOD</th> <th>VERY GOOD</th> </tr> <tr> <td>1 2 3 4 5 6 7 8 9 10</td> <td>11 12 13 14 15 16</td> <td>17 18 19</td> <td></td> </tr> </table> Comments/Suggestions	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD	1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19			
	UNSATISFACTORY	MARGINAL	GOOD	VERY GOOD							
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19									



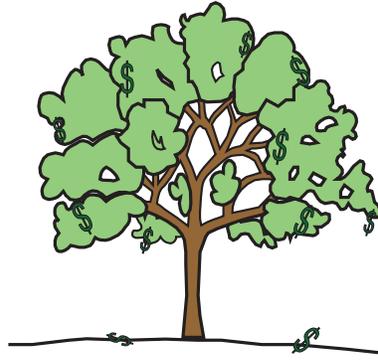


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"So get a few laughs and do the best you can." Will Rogers

Therefore, to train any person in any field, it is necessary to break the task down into the following criteria:

- * Sequence & Number each Step
- * Describe the Step Action
- * Add Comments & Guidelines
- * Safety Approval & Sign Off
- * Speed Approval & Sign Off
- * Quality Approval & Sign Off
- * Step Activity Time Record
- * Step Elapsed Time Record
- * Step Cost Calculation
(Activity and Cumulative Cost.)



"If you are planning for a year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people."
Chinese Proverb

performance percentage for each step. Clearly, as part of the creation of the standard operating procedure, the training map, and the evaluation form, the level of acceptable performance for each step and for the entire procedure, must be pre-determined and precisely defined.

In summation, the key to the *SOP*, the *Training Map*, and the *Performance Evaluation Guide*, is they are prepared, they are organized, and they are implemented by the work team themselves. The advantages of providing the work teams with their own, self administered, comprehensive system of training, is it is based upon daily activity, and the activities which really matter in the process.

The tool we use to define the task work structure is the *Standard Operating Procedure*, (see page 10), the tool we use to organize the entire training program and the trained status of each team member is the *Training Map*, (see page 11); and the tool we used to certify each team member, to indicate they are proficient in the procedure, is the *Performance Evaluation Guide*. See bottom of previous page.



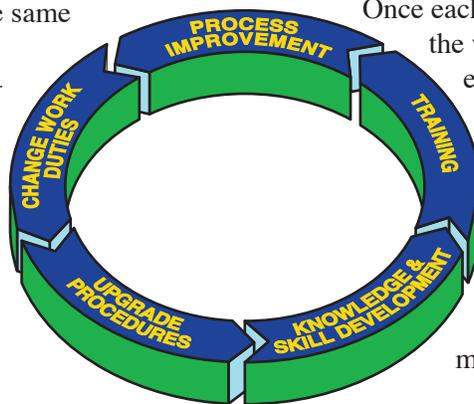
The simplicity of the program, and the fact that it is controlled by their peers, gives the team member confidence in the accuracy and the fairness of the training system.



In unifying process improvement and training through the use of consistently applied procedures we close the development loop by creating an evaluation format based upon the performance of each step and the successful completion of the entire procedure.

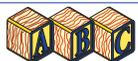
The creation of the Training Map and related documentation and certification tools will provide the solid foundation, essential for building an effective system of training. All the steps in the process are critical, from creating the standard operating procedure, to the Training Map, to the Performance Evaluation Guide, are necessary, however, there is a more effective method of using this information to teach and to train.

The task performance evaluation chart is created using the same sequence of steps and the same measurement criteria to determine acceptable performance. The classifications for each are *Unsatisfactory, Marginal, Good, Very Good, and Excellent*.



Once each procedure is complete and approved by the work team, the person with the greatest proficiency in the procedure, should be videotaped executing each step in the procedure by another member of the work team. In addition, either the person executing the procedure, or the videographer, or another team member, should provide a voice over recording, to explain the execution of each step in more detail.

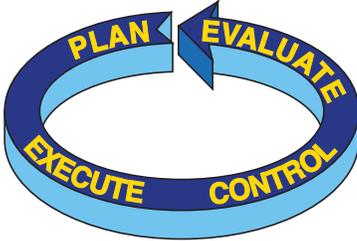
In addition, the measurement of how well each step is performed is graded from 1-25, with the total being multiplied by 4 to give the





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"Come what may, time and the hour runs through the roughest day." William Shakespeare



The ability to implement a training program based upon up-to-date videotapes of the execution of each procedure will greatly simplify the learning of a new skill, or the upgrading of an old skill.



establishing a system of technical education, they are the most critical steps the organization can take to fundamentally transform the system of manufacturing. There is a great deal to do at the beginning of establishing an effective training

Just imagine starting at the company for the first time, and instead of suffering through the erratic watch-me method of learning, the trainee was given a series of approved videotapes to prepare for their shop floor experience.

system, however, once the structure is in place, building a system of benchmarked standardized procedures is a relatively straightforward process.

This technique would accelerate learning, it would ensure training was more accessible to a wider range of people, and it would significantly reduce the cost of training.

There is a choice between moving forward or falling behind, and your choice is...?

"Destiny is no matter of chance. It is a matter of choice: It is not a thing to be waited for, it is a thing to be achieved." William Jennings Bryan

There are relatively few steps in setting up the Training and Skill Development program, however, each step is critical to the end result, and each step should be carefully executed.

Key Result Analysis Measurement

Common Sense states that... Standard Operating Procedures are established by measurement against an established benchmark and their implementation is measured against the same benchmark, therefore, a simple, statistical, real-time system of measurement is essential to progressive change. The Key Result Analysis System is a powerful, statistical charting

The Recommended actions are to:

- 1: Select a Project Leader and/or Project Leaders
- 2: Form Work-Project Teams
- 3: Implement a Company Project Communication
- 4: Analyze the Process

Traditional Measurement	Time Based Measurement
✔ Cost is the metric	✔ Time is the metric
✔ Look to Financial Results	✔ Look to physical results
✔ Utilization-oriented measures	✔ Throughput-oriented measures
✔ Individual measurement	✔ Team based measurement

and measurement system, which is easy to use, and is one which graphically delivers clear and comprehensive technical analysis

- 4.1: Divide the Process in Functional Areas and Prioritize a Development Strategy
- 4.2: Divide each Function into Separate Disciplines
- 4.3: Divide each Discipline into Individual Activities or Procedures.
- 4.4: Divide the Process into Job Disciplines & Assign SOP's to each area of Expertise

and performance data, which is focused, accessible, elegant and precise.

The numbers tell you how your business is going, not why." ~Johnathen P. Siegel

- 5: Develop the Training Map
- 6: Develop the Performance Evaluation Guide for the First Series of Procedures



In manufacturing measurement is critical to success. *The harsh reality is, if we do not measure the process, it is impossible to manage the process.* Our primary goal in diecutting and in the fast

	Time is a more useful and a more accurate management tool than cost.
	Cost is normally a symptomatic, after the fact, lag indicator of productive efficiency.
	Time based companies reduce cost indirectly by compressing time.

Although there are only six steps in

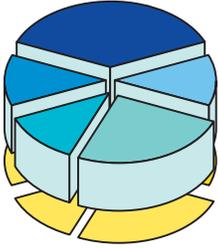




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"A day is a miniature eternity." Ralph Waldo Emerson

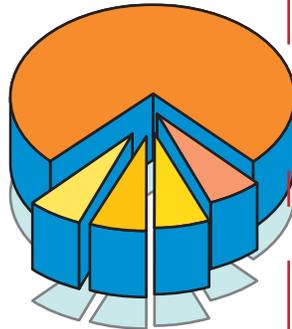
What Should We Measure?



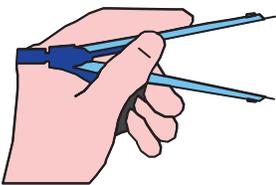
changeover project is first to stabilize, second to standardize, and then to continually increase the speed of processing. This drive for improvement is often referred to as Faster, Cheaper, and Better. But faster than what, and what is the benchmark? And less expensive than what, and what are the cost parameters? And better than what and how, do we determine the correct degree of quality or conformance to what requirements?

All are everyday questions, which require definitive answers, and to provide answers we have to provide quantitative data, or a measurement of performance. These measurements can include speed, they can include time, they can include yield, they can include pressure, they can include cost, they can include quantity, they can include quality, and they can include dimensions, to mention a few of the possibilities. But everything can and must be measured.

If we fail to draw a line in the sand, how do we know where we are? How do we know if we are getting better or getting worse? And how can we determine if we are moving in the right direction.?



Most measurement systems are, after the fact, measurement. In other words an analysis of the information and performance measures collected will be analyzed and evaluated several days after the production cycle is complete. This provides useful data about trends and about productivity in general, but it is far too late to have any impact on the process it measured. In addition, because much of the data collected has little meaning to the diecutting team, their performance in collecting the data and taking measurements is inconsistent and often incomplete.



The **Diecutting Key Result Analysis System** described in this section has many advantages over current measurement systems, however, the most important advantage is it yields immediate feedback.

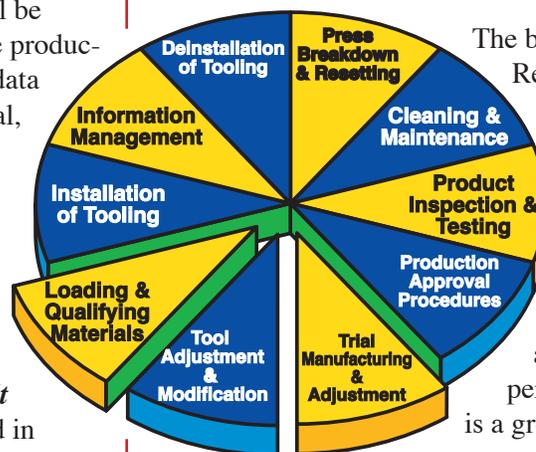
The information collected gives immediate feedback to the operator and to the technician, and it is equally valuable at a later date to the supervisor and to the manager.



One very effective option is to implement the Key Result Analysis system. **What is Key Result Analysis and why is it effective in the diecutting converting operation?** There are several reasons why this basic statistical data collection system is the best choice for diecutting. These would include:-

- ➔ **Key Result Analysis is a graphic method of measurement, which is simple to execute and easy to understand.**
- ➔ **Key Result Analysis is based upon Pareto Statistical Analysis.**
- ➔ **Key Result Analysis is effective because it provides immediate feedback and it is transparent to anyone viewing the information.**
- ➔ **Key Result Analysis is a simple method of data collection, however, it is one which provides sophisticated and powerful feedback.**
- ➔ **Key Result Analysis has the flexibility to adapt to several types of measurement in diecutting converting.**

How do we implement this system of measurement?



The best way to explain Key Result Analysis is to complete a step-by-step analysis of the application of this technique to Press Changeover and to Press Production.

This article is directed at improving changeover performance, therefore, this is a great place to begin. However, we start with a question?

What is Press Changeover or Press Make-Ready? This is an important question because the roots of our difficulty in managing and improving press make-





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"Time is nothing absolute; its duration depends upon the rate of thought and feeling." John Draper

ready is our habit of describing it as a single discipline.

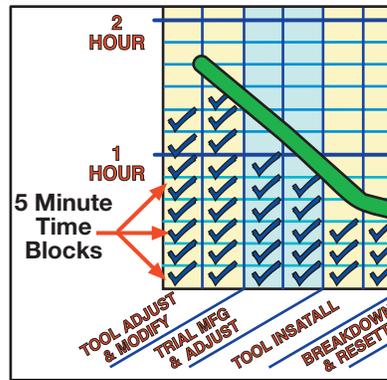
In fact press make-ready or changeover is made up of the integration of ten disciplines or building blocks. See above. These Make-Ready Disciplines are:

- * Data & Information Management
- * Deinstallation of Old Tooling
- * Loading & Qualifying Materials
- * Press Breakdown & Resetting
- * Press Cleaning & Maintenance
- * Installation of Tooling
- * Trial Manufacturing & Adjustment
- * Tool(s) Adjustment & Modification
- * Product Inspection & Testing
- * Production Approval Procedures

CHANGEOVER TIME CONSUMPTION

- 01: Tool Adjustment & Modification
- 02: Trial Manufacturing & Adjustment
- 03: Installation of Tooling
- 04: Press Breakdown & Resetting
- 05: Product Inspection & Testing
- 06: Deinstallation of Old Tooling
- 07: Loading & Qualifying Materials
- 08: Production Approval Procedures
- 09: Cleaning & Maintenance
- 10: Information Management

Understanding the breakdown of make ready is an essential starting point in improving the process. Once we have accepted this logical breakdown of changeover activity the next obvious question is, how is time allocated to these disciplines? The ten disciplines are obviously not evenly balanced, see left, but reflect the complexity of each discipline. So how can we reveal the breakdown of time in press make-ready?



The first step is to create the statistical Key Result Analysis Form shown below as this will provide a simple and an easy to understand vehicle to evaluate each make-ready process and break each make-ready cycle into the ten separate disciplines previously identified. This measurement format will be used to complete the first stage of make-ready/changeover analysis.

The structure of the data collection tool is broken into 11 vertical columns, which reflect the previously named 10 disciplines, plus the option of "Other" or "Miscellaneous" to capture any unusual and unplanned activity.

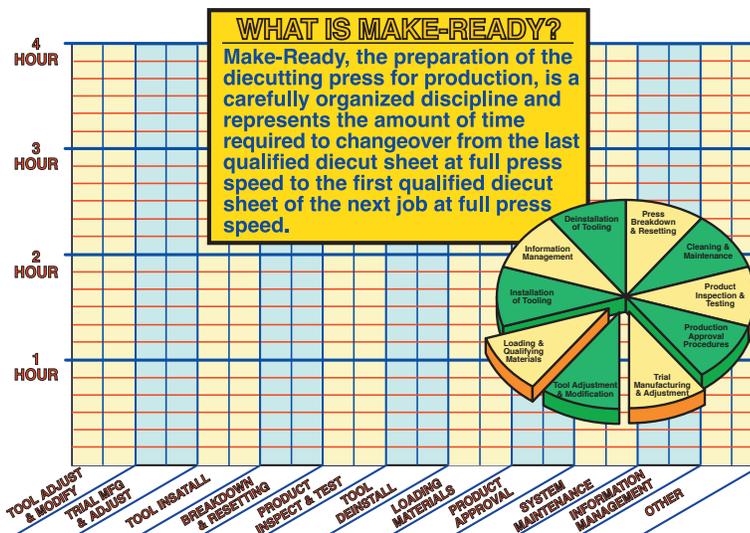
The diagram to the left shows the basic structure of the form. Each column is broken vertically into 4 x 1 hour blocks, and each 1 hour block is divided into 12 x 5 minute cells. Using an observer to monitor a number of make-ready cycles, the timekeeper simply adds a check mark to each 5 minute cell in the appropriate column as the activity is taking place and as the time is accumulating.



There are two important pointers here. I do not believe it is necessary to institutionalize one specific focus on one measurement. It is more effective to implement a measurement initiative to reflect the focus of the work team as they are attempting to analyze, measure and improve a specific activity in make ready.

In practice there is always some form of measurement taking place, but using a statistical approach, it is rarely necessary to monitor more than 5 to 15 cycles of any activity.

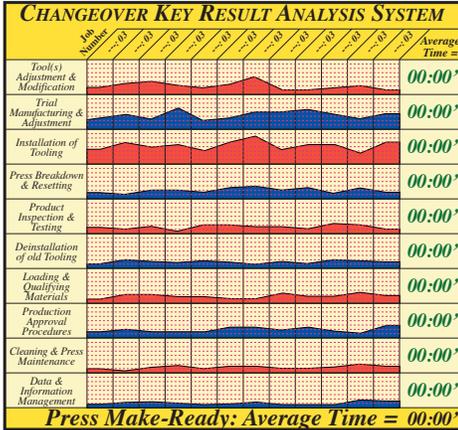
The second point is the advantage of using one of the work team as an observer and as a timekeeper, in this specific example of measurement. In some of the





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"Time is the product of changing realities, beings, existences." Nicholas Berdyaev



examples provided this is not necessary as the press operator can easily accomplish many measurement duties.

To implement this first level analysis of press make-ready, figuring out how and where

time is consumed during the activity, a minimum of 5 cycles should be sufficient. However, the form shown left, is designed to capture 12 press changeover cycles, and develop an average number or an average percentage of time consumption for each separate discipline.

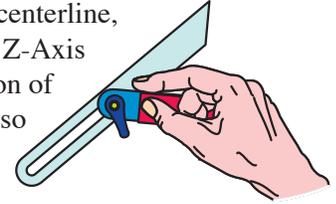
This layout has the advantage of being able to compare the average make-ready time, and/or to focus individually and collectively on each of the ten individual disciplines of make-ready.



To summarize the use of this first stage of make-ready analysis, the analysis of a number of press changeover cycles will eventually show a breakdown of time consumption for the various activities of make-ready. See above. As you can see from the Pareto statistical breakdown of time from several press changeover cycles, the analysis is showing that the majority of time is expended in **Tool Adjustment & Modification**.

This simply means work done on any one of the various tools, from the patch-up sheet, to the steel rule die and counters, to the male and female stripping grids, and the bottom pin tool. This could include fine tuning to

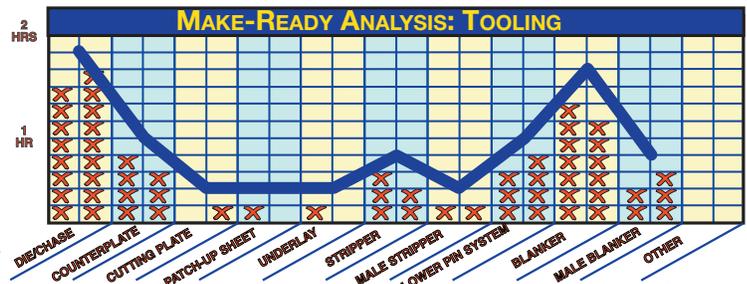
the alignment to the press centerline, or to the adjustment of the Z-Axis male and female registration of each tool to each other. Also to the synchronization of one tool set to the next, as each tool set is installed and aligned on the press. This would certainly also include repairs, modifications, or changes to the tool, as part of the make-ready process.



To summarize where we are, we have identified the 10 disciplines of make-ready, and we have completed an initial Pareto analysis of the process, which demonstrates that tool adjustment and tool modification is the largest consumption of time during make-ready. **This is a good start, but where do we go from here?**

As before we need to narrow the focus and analyze the tool adjustment and modification discipline, to determine where time is being consumed. Using a similar format we create an analysis grid with each column representing each tool used on press. These include the die/chase, the counterplate, the cutting plate, the patch-up sheet, the underlay, the female stripping tools, the male stripping tools, the bottom pin or lower pin system, the female blanker, and the male blanking tool.

As before each vertical column is divided into 4 hour divisions, (only two hours are shown in the illustrations), and each 1 hour division is divided into 12 cells each denoting five minutes of time. As before



the timekeeper records the make ready activity, but concentrates on the installation and the modification of tools, and adds a mark to each cell representing the time consumed in working on that tool.

As you can see from the analysis above, the greatest consumption of time was expended in working on the steel rule die. As we did earlier in the analysis we have



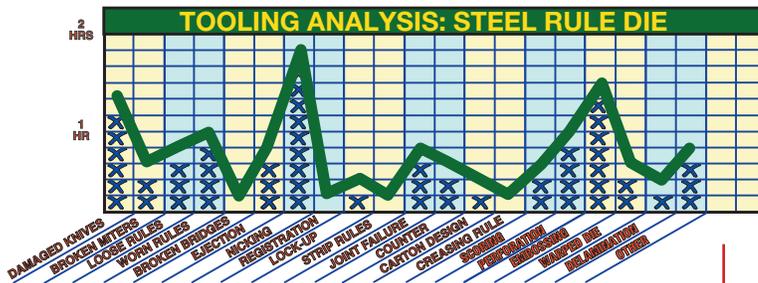


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"Time is an avid gambler who has no need to cheat to win every time." Charles Baudelaire

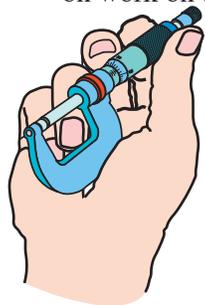
made progress, however, the information we have is not detailed enough to take remedial action, and therefore, we need to conduct another level of analysis.

Therefore, the next stage of analysis is to focus entirely on the performance of the steel rule die. This involves breaking the steel rule die on-press usage discipline into 20 separate areas of analysis. As you can see *below*, the vertical columns include dam-



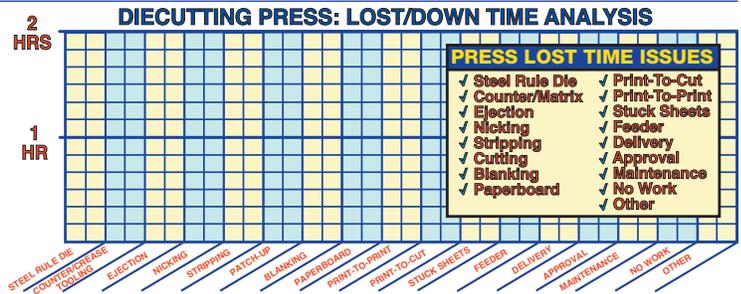
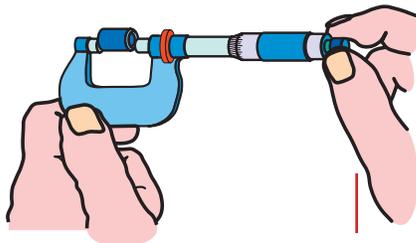
aged knives, broken miters, loose rules, worn knives, broken bridges, etc. Where did we get these categories from? Actually, from conducting these analytical techniques, we also identify each type of press stoppage caused by each different tool failure.

As in the earlier forms each vertical column is divided into five minute cells, and the timekeeper only focuses on work on the steel rule die for a number of make-ready cycles. This example analysis demonstrates that the greatest consumption of time is in nicking, and/or in adjusting nicks to get the sheet to flow through the press without breaking-up.



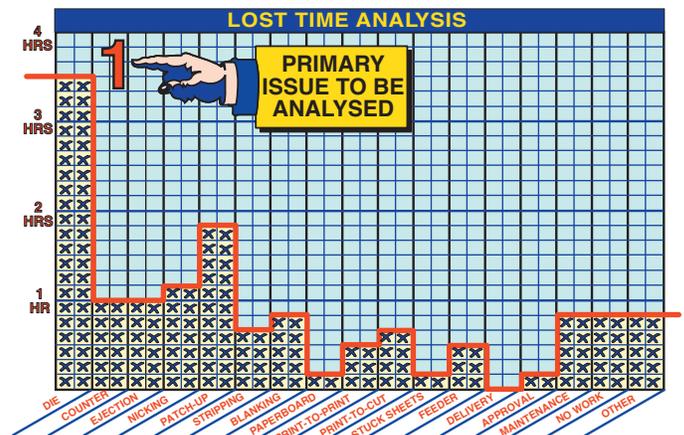
To this date we have used three different versions of the Key Result Analysis forms, and after 15 to 20 make-ready cycles, we have learnt a great deal about the changeover process and we have zeroed in on Nicking as the key problem to be analyzed and addressed. If you are completing two press changeovers per day, which is obviously a low number, in less than two weeks we have completed a detailed analysis of the make-ready discipline. In addition, as you can see execution is simple and straightforward, and the information generated is clear, accurate and unambiguous.

After each make-ready is complete; the real test of



the effectiveness of the changeover begins. Diecutting production presents its own series of technical and performance challenges, and just as we need to understand what is happening in changeover, and how we can fix the problem, we need similar data from press production.

Most professionals would agree that there are three things that happen on-press. *These are Make-Ready, Production, and Down Time or Lost Time.* If we are to control and to manage this process it is important



to understand what is happening, so that we can focus our knowledge and skill on the problem. But first we have to identify the problem!

The Key Result Analysis chart for Lost Time or Down Time Analysis is show at the *top of the page*. The individual columns in this chart show the steel rule die, counter and crease tooling, ejection, nicking, and stripping, etc, as some of the potential down time problems. Naturally, as you use this type of chart you can customize the lost time categories to reflect your specific type of work, and/or you can use the production run itself to identify the lost time issues. *The chart above* shows the typical feedback you may encounter.

The chart is recorded by the timekeeper or the press operator





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"Time is what we want most ... but what we use worst." William Penn

Sheet Break-Up: CheckSheet	
STEEL RULE DIE	
FIBER-GLASS COUNTER	
MALE/FEMALE STRIPPING	
MALE/FEMALE BLANKING	
PATCH-UP	
PAPERBOARD PROBLEMS	
PRINT-TO-PRINT REGISTER	
PRINT-TO-CUT REGISTER	
STUCK/DOUBLE SHEETS	
FEEDER PROBLEMS	
DELIVERY PROBLEMS	
WAITING FOR APPROVAL	
NO-WORK AVAILABLE	
UNKNOWN CAUSE	

as before, and the greatest number of problems occur in the steel rule die, which would naturally lead to the creation of another chart to analyze and investigate the causes of steel rule die lost time. To make the chart as easy as possible to use, it should be adhered to the face of the press with a pen or pencil attached on a chain. Then all the press operator has to do is to add a check mark in each 5 minute cell to indicate the specific type of down time fault experienced.

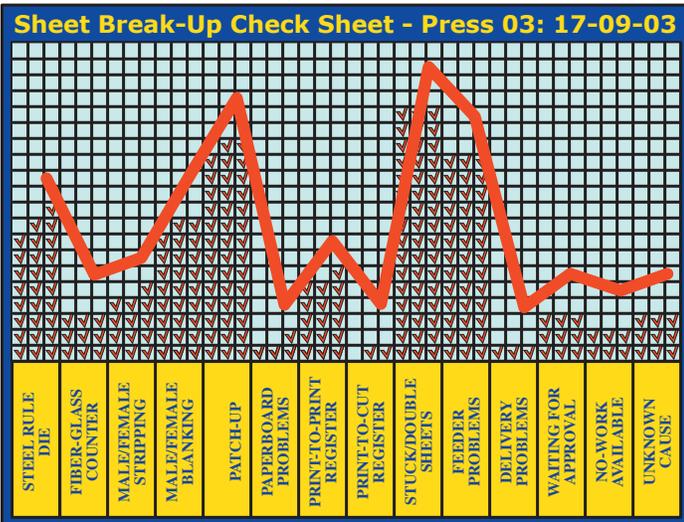
One of the perennial problems of running a sheet fed platen diecutting press at high speed, is lost time caused by sheet break-up. This is a time consuming problem as each break up is both a waste of time and a waste of value-added material. Operators often feel they have a good handle on how frequently this happens, and where in the press the break-up occurs. However, prolonged statistical studies have demonstrated even experienced press operators are surprised by how frequently sheet break-up happens, and where it happens. Therefore, we should not make assumptions or take anything for granted.

The tool used to capture and analyze sheet break-up failure is the check sheet. *See above.* The potential

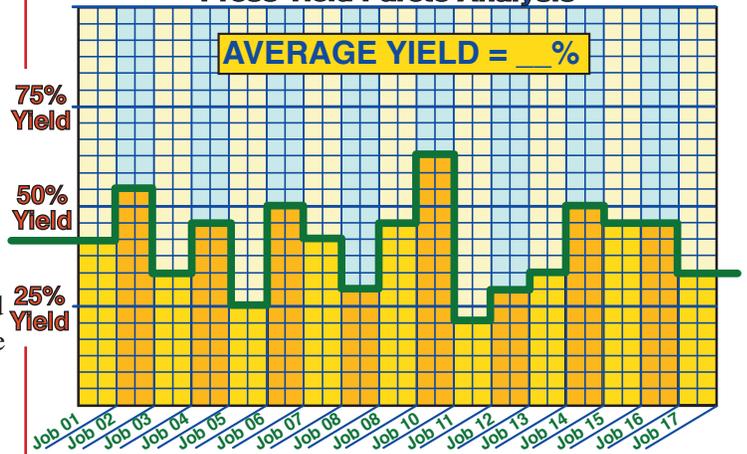
causes of sheet break-up are listed to the left of the chart and may include sheet break-up stemming from the action of the steel rule die, the fiberglass counter or the Matrix crease tools, and feeder problems and delivery problems. To the right of each category of stoppage is a number of cells in which the operator will make a single check mark to indicate a single incident.

At the end of the production run the chart is rotated and the high points of each category of incident linked. *See the bottom of the previous column.* This is a very simple but a very effective tool as it immediately provides an indication of the source of the problem, with great clarity.

Another critically important tool in diecutting press production is to collect information about and to focus



Press Yield Pareto Analysis



every ones attention on the importance of press yield. While we discuss and focus disproportionately on press speed; the real measurement of productivity is production yield. In the Key Result Analysis chart *above*, we have adapted the format we have used previously by designating each 5 minute cell as representing either 100 sheets or 150 sheets or 250 sheets, or whatever the average hourly production output is. Although we talk about press speed, the sad truth in our industry, is the average press yield is less than 50%!

As you can see from these examples, the Key Result Analysis approach to process measurement is endlessly flexible, it is simple and straightforward to use, and the stark graphic display of whatever performance is being measured makes it easy for anyone to understand, but most importantly, it makes the information





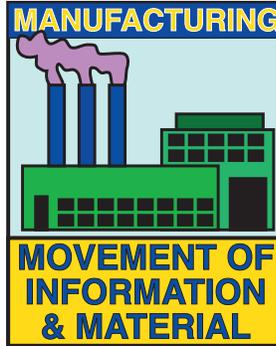
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"Invincibility depends on one's self; the enemy's vulnerability on him." Sun Tzu

difficult to ignore.

Information Management

Common Sense states that... Converting manufacturing is fundamentally about two things: the movement of information and material, and it is essential to develop an up-to-date information and data management system, which will accurately document each key performance parameter of the tools, the materials, the products, the technology, the customer-supplier chain, the work areas, the work teams, and their methods and practices, to provide the information to drive continuous performance improvement. Accurate, timely, accessible information is the lifeblood of successful diecutting converting.



turing process. In the most basic and the most important terms, manufacturing is simply about the movement of information and material.

It does not matter if the operation is producing automobiles, doughnuts, cell phones, furniture, strawberry jam or sunglasses; manufacturing is about adding value to raw materials by transforming the material into a product of higher value. The information is used as the guide, the instructor, the controller, and the blueprint or map of activity.

In manufacturing, we have several different types of information. There is the initial burst of customer information, which instigates the beginning of the production process. The information is then filtered, transformed, manipulated, and converted, by each functional area of the converting operation, into the plans and actions, which will instigate the beginning of each process.

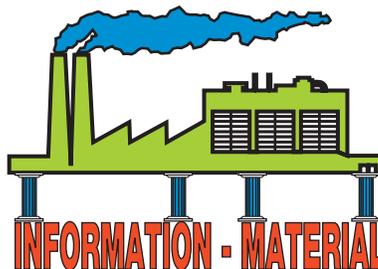
INFORMATION QUESTIONS

- What information is required for each task?
- Where is the information generated?
- How is the information generated?
- When is the information generated?
- When is the information required?
- How is the information documented?
- Who is responsible for the information?
- How does information flow from process to process?
- How is information validated, archived, and protected?

A day in the life of the CAD Designer, the Diemaking Toolmaker, the Pre-Press facilitator, and the Diecutting Technician is usually densely crammed with a wide range of diverse activity, all executed at a furious pace. This converting-manufacturing treadmill will include problem solving and brainstorming; research and testing; developing new methods and procedures; coaching, learning and teaching; not to mention one other slightly important issue, production!

This activity is what is called, getting experience! In practice, the ability of each individual to play an effective team role in this fast flow process is based upon the ability to rapidly assimilate new ideas, and to quickly turn new knowledge and solutions into practical improvements to the diecutting process.

To gain maximum education and experience benefit, from every hour of every day, it is important the professional crafts person understands the underlying principles of the manufac-



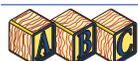
TYPES OF INFORMATION

- The Converting-Manufacturing Process
- Safety Systems & Wellness Management
- Quality Management & Education
- Customer-Supplier Chain (Internal)
- Customer-Supplier Chain (External)
- CIM-CAD & Structural Design
- Tool Specification & Design
- Tool Converting Parameters
- Tool Machining & Fabrication
- Tool Materials & Components
- Tool Preparation & Management
- Toolmaking & Processing Technology
- The Toolmaking Manufacturing Process
- Diecutting & Processing Technology
- Diecutting System Maintenance
- The Diecutting Manufacturing Process
- Product & Packaging Applications
- Diecut Material & Manufacturing
- Training & Skill Development
- Teambuilding & Teamwork
- Problem Solving, Research & Testing
- Work Planning & Work Organization
- Process Improvement & Benchmarking

out the process. This information processing discipline enables each department, each work team, and each individual to add value to the process as the emerging product passes through their control.

This data processing activity is called the Information Cascade, as the information management discipline seeks to specify, to define, and to identify the essential flow of data through the entire organization.

Effective information management is impossible without effective teamwork. Therefore, the first step in reorganizing the flow of information in diecutting-converting, is to get the entire diecutting converting team together, including representatives of the internal supplier-customer chain. The goal is to explain the project, and to define the series of team activities





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"Thus, what is of supreme importance in war is to attack the enemy's strategy." Sun Tzu

INFORMATION MANAGEMENT QUESTIONS	
✓	How important is information management?
✓	How do we use information in diecutting?
✓	How do we collect the information we have?
✓	How do we know the information is correct?
✓	How do we know we have all the information?
✓	How do we process & verify the information?
✓	How do we purge & upgrade the information?
✓	How do we manage the information resource?
✓	How is information responsibility assigned?
✓	How do we find information we do not have?

and milestones, as the information project is developed and consolidated.

The steps in the process include:

→ Define, discuss, and brainstorm ...

- * The importance of accurate, up-to-date information, to effective work planning and organization; and to process control?
- * How accurate information can productively impact every diecutting-converting activity?
- * How accurate information can simplify and reduce process and processing complexity?
- * How accurate information can make the job easier, how it can reduce stress and how it can reduce frustration?
- * How accurate information can make the company faster, better, and more competitively secure?



→ Define, discuss, and brainstorm ...

- * How we currently use information?
- * How we manage the information resource to ensure the right information is in the right place at the right time?
- * How we gather information, how we apply it, and how we organize the resource?
- * How we assess, verify and validate the accuracy of the information we accept?
- * How we generate information, how we disseminate it, and how we organize the resource?
- * How we assess, verify and validate the accuracy of the information we deliver?
- * How we consolidate, organize, protect, and secure the information resource?

→ Define, discuss, and brainstorm ...

- * How to classify and to categorize information used in the diecutting-converting process?
- * How to identify the primary source for

each category of information delivered?

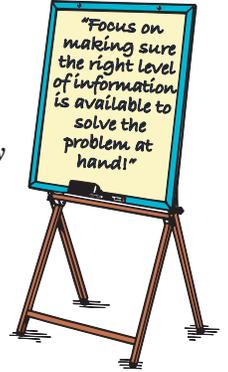
* How we assign responsibility for the control and delivery of

information?

- * How to identify the primary source for each category of information transmitted?
- * How we assign responsibility for the control and delivery of this information?

→ Define, discuss, and brainstorm

- * How the barriers and obstacles to the flow of information impact diecutting converting?
- * How previous or existing initiatives are changing the status and the delivery of information?
- * How we identify key weaknesses and key remedial actions to improve the timely flow of accurate information?



→ Define, discuss, and brainstorm ...

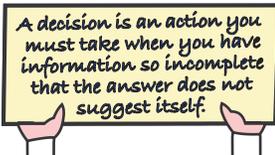
- * How variable performance in the various categories of diecutting and processing information impact productivity and quality?
- * How to list, organize and prioritize the information categories, requiring reorganization and improvement?

→ Define, discuss, and brainstorm ...

- * Evaluate the top information category ...
 - How we use information in this discipline?
 - How incorrect, missing, or the late arrival of information causes problems in this discipline?
 - How we could restructure the system of information in this discipline to improve processing performance?

→ Define, discuss, and brainstorm ...

- * How we prioritize action in this initiative?
- * How we select who is to lead this initiative?
- * How we select who will be part of the project team?
- * How we determine what are the resources available to the team?
- * How do we determine the goals of the information management project?
- * How we select practical projected project milestones and deadlines?
- * How we determine when





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"One defends when his strength is inadequate; he attacks when it is abundant." Sun Tzu

the project begins?

The recommendations in terms of implementation of the project strongly emphasized the importance of simplicity and starting slowly and steadily, using traditional methods in the beginning. The recommendations were:

The Information Network should be defined as a data "Exchange" system, as each participant should derive value from each exchange of knowledge.

protected.

→ As the information resource is developed, it may be necessary to provide access to the data base using a scanned, identification card. This will qualify the user to the level of information he or she is authorized to access and to enter.

- Each information category should be stored in a single three ring binder, with each divider corresponding to a classification of information from that category.
- The manuals should be upgraded weekly.
- The manuals should be upgraded, purged and duplicated monthly.
- One person from each department, and wherever necessary, from each shift, is assigned the responsibility of managing the information resource.

William Feather; "An education isn't how much you have committed to memory, or even how much you know. It's being able to differentiate between what you do know and what you don't. It's knowing where to go to find out what you need to know; and it's knowing how to use the information you get."

Inventory Management

Common Sense states that... It is vital to have everything necessary for the execution of any task or activity, from information, tools, materials, supplies, parts, equipment, to work-in-process, in the right place, in the right quantity and at the right time. Our mission is to develop a lean manufacturing operation in which a comprehensive inventory control discipline is used to minimize waste of time, space, materials, movement, duplication, over-production, defects, labor, money, and the inefficient consumption of any resource. Inventory control is the management of everything required, but nothing more, to complete any activity in diecutting converting.

"Even smart people make bad decisions, when the information they use is incorrect."

→ As the information resource takes shape, the information system can be organized and formatted to fit onto a standard commercial data base.

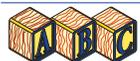
"Efficiency & economy imply employment of the right instrument and the right material as well as their right use in the right manner."

- As computerization of the information resource takes shape, information resource access points throughout the operation should be planned.
- At the access points data is allowed to be accessed, entered, and printed, however, information will only become a permanent part of the resource, as it is approved by the key information manager appointed within each discipline.
- To keep the information resource as updated as possible, the consolidation of new data and the revision of existing data, must be completed weekly.
- All manuals, worksheets, and documentation tools must be scanned and entered into the database as accessible and printable PDF files.
- System back-ups are automatically scheduled daily, and run invisibly in the background.
- All information is copyrighted and password **Don't Get Lost!**



There are many different materials, tools, components, parts, supplies, information, and work-in-process resources required to complete each step in the manufacturing process. These activities could include ruling a steel rule dieboard, it could be locking the die in the chase, it could be rubbering the die, it could be nicking a die, it could be taking an impression, and it could be patching up the job to achieve a kiss cut impression.

Everyone of these activities requires tools and equipment, materials and supplies, parts and components, and information to complete the specific task. Every



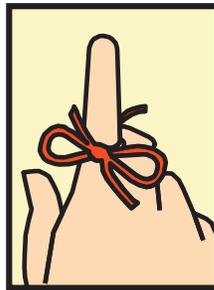


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"Never trouble trouble till trouble troubles you."



one of these resources is either permanently located at the site of the activity; or it is temporarily delivered to the site of the activity, and is returned to a dedicated storage location; or it is a consumable resource, which must be replenished as it is used; or it is work-in-process, which is transformed by the activity; or it is product and waste, which must be managed and delivered to the correct location; or it is information, which is required to guide the activity, and information, which is generated by the activity, which must be managed and delivered to the correct location; it is the space itself, which must be minimized to reduced cost, but which must be large enough to accommodate the safe execution of the activity; and it is the integration with the internal and external customer-supplier chain to coordinate the delivery of everything needed to execute each task in a lean and an efficient manner.

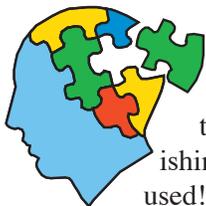


The goal is to be able to complete a specific diecutting-converting task with minimal preparation time, and minimal movement from and around the activity to access tools and materials and information and resources.

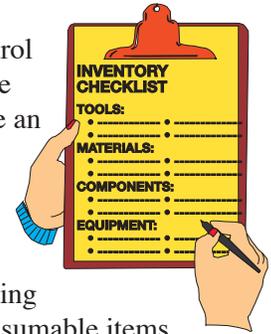
For example, if it became necessary to add nicks to a die on-press, how would inventory management and control impact this activity?

As nicking the die is a common on-press activity, the nick grinder, and a complete inventory of wheels, nicking device tools, safety glasses, and an extension power cord or an air line, depending upon the type of grinder, should be stored in a retractable overhead tool rack, or in a shadow box, mounted on the face of the press or in the immediate proximity of the platen well.

As this activity will probably require the removal and repositioning of ejection material, we also need pliers to remove the rubber, a scraper to clean the dieboard surface, a supply of different ejection materials, a cutting tool to cut the rubber to size, the correct adhesive based upon the type of rubber, and a method of replenishing all of the consumable items as they are used!

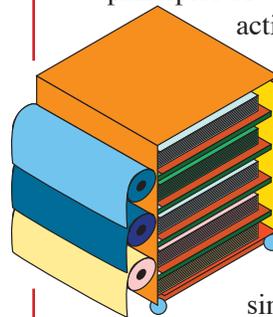


Inventory management and control is not only making sure you have everything you need to complete an activity immediately on hand. It is designed to ensure that whatever activity is being executed, it is organized in a manner to minimize time to access everything that is needed, and all of the consumable items are replenished to the correct supply levels.

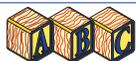
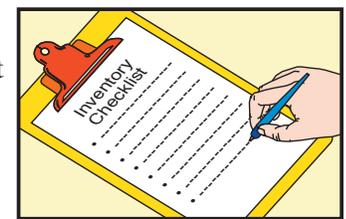


How often have you nicked a die on-press where the nicking wheels are missing or are all broken, where the nick grinder is on the next press, where the adhesive has dried out, where someone has misplaced the safety glasses, or where you have to walk to the diemaking department or to the pre-press area to find the correct ejection material? These are the invisible productivity killers which account for so much wasted movement and non-value added time in diecutting.

The model for press changeover organization we describe is the hospital emergency or operating room. We use the following description to define how the principles of Just-In-Time organization apply to this activity. However, when you read this, think in terms of all of the tools, materials, and supplies, which must be in place, and which must be replenished to keep this key area in optimal operating condition.



In this specialized environment, every single item is pre-determined and pre-checked; everything is in optimal condition; everything is stored as close to the action as possible, without crowding the activity; everything is stored in the identical location it was stored in, as it was every other time the work area was used; every material, every supply, every tool, every piece of equipment, every piece of information, and every component, is stored in a predetermined location, and consistently applied location; everything that is needed is available and nothing that is not needed, the area is as compact as possible, but not so compact as to inhibit the activity; at the





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"To be absolutely certain about something, one must know everything or nothing about it." Olin Miller



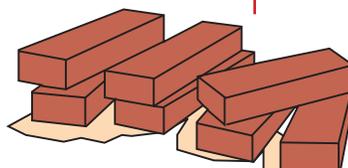
end of every cycle, the work area is purged, restocked, and prepared for the next emergency; during the activity the work area is restricted with only essential personnel admitted; every team player has a designated role and a designated position during the activity; and every team player understands the sequence of events and is ready on cue to provide the technical assistance required.

Each participant became a member of this elite team after extensive training and education. Is this the same as press changeover? You may disagree, but in principle the only difference is the activity, the tools, and the skills being applied. The principles and the practices of how this room or work area is organized is identical to the principles and practices used to organize fast press changeover. And this approach is identical to our inventory management requirements to make sure everything is where it is needed and when it is needed.



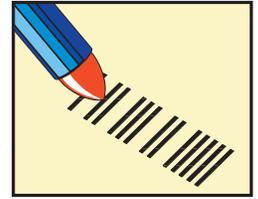
- *The first step in any new project must be to get the entire work team together to describe the project, to outline the potential benefits of the change, to discuss the obstacles and challenges, and to brainstorm methods and practices for starting the project.*
- *The work team should adopt the description of the Hospital Emergency Room as the model for the reorganization of key on-press and off-press areas of activity.*
- *The work team should define the work areas or activity centers on press. These will include the operator side of the press, the off-lay or gear side of the press, the end of the feeder and the end of the delivery. In addition, we must include the underside of a unit and the inside of a press unit. These work areas could include:*

- * *The Press Feeder*
- * *The Press Feedboard*
- * *The Platen Stack*
- * *The Platen Well*
- * *The Stripping Unit*
- * *The Blanking Unit*
- * *The Delivery*



* The Waste Extraction System

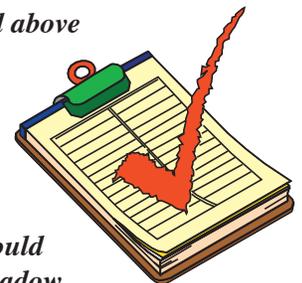
- *The next step is to prioritize these work areas or work cells for Inventory Control preparation. My suggestion would be to begin at the Platen Stack or Diecutting Section as this is where the majority of work takes place.*



- *With the specific work cell selected, the organization of the work area can begin. This requires listing everything required to complete the activity, and without leaving the work area. This would include:*

- * *Job Information & Storage*
- * *All Hand Tools*
- * *All Power Tools*
- * *All Power Outlets*
- * *All Air Outlets*
- * *All Converting Tools*
- * *All Materials*
- * *All Supplies*
- * *All Parts & Components*
- * *All Equipment*
- * *All Safety Gear*
- * *All Maintenance Equipment*
- * *All Maintenance Supplies*
- * *Any First Aid Supplies*
- * *Work-In-Progress Storage*

- *Every component listed above must be given an identification number, and a permanent or a temporary on-press storage location.*



- *The storage location could be a single location shadow box, preferably color coded, which is mounted on the face of the press, or if it is a temporary tool it would be mounted on a mobile tool module which has color coded, single location shadow boxes, to hold temporary tool and material required to complete one activity or a sequence of activities.*

- *The storage location could be a single location Shadow Box, preferably color coded, which is mounted above the work area on a retractable overhead counterbalanced gantry. This allows*





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"Common sense is the knack of seeing things as they are, and doing things as they ought to be done." Josh Billings

the tools to be accessed and replaced instantly. However, when not in use the gantry can be locked in the retracted position.

- *Some of the materials and supplies are consumable items, such as patch-up tape, carbon paper, grinding wheels, ejection material, and patch-up sheets, to specify a few. Some of these materials are kept on-press permanently, as they can be required at any time, however, some of the consumables are only required during a press changeover. Therefore, all of the consumable items must be subjected to a post-process checklist immediately after each changeover to ensure they are always in optimal condition and in the correct quantity.*



Diecutting is very similar. You have a task to complete on-press, and the inventory management and control checklists are simply there to make sure you have everything you need to complete the activity as fast as possible, as easy as possible, and in the least amount of time.

It is obviously important to standardize the inventory control distribution of tools, materials, and components, to ensure everything is maintained in the approved positions, and to create a master blueprint to record changes and progressive upgrades to the system. To manage the layout:

- *The next step requires creating an accurate map of the press and the surrounding areas, particularly if these areas are involved in press changeover, or are used as staging areas for new and old tools. The map should be executed on graph paper, or directly programmed into a CAD System, using a scale such as 1/4" per foot.*

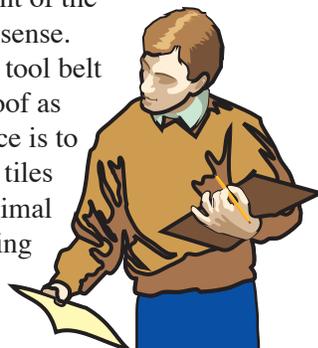
- *The next step requires using the map to position all of the tools, supplies and components, which will be used in make-ready.*

- *The positioning of tools and materials is critical. Every step we take, every time we reach for a tool consumes the base time block of time management, 6 seconds. Also we defined transportation as one of the potential waste sources in manufacturing. Therefore, all of the tools, the materials, the components, and the parts must be positioned as close to where they will be used as possible.*

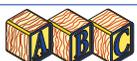


- *It should be recognized, that until the final layout, organization, and placement of every tool, material, and component, it would be most effective to develop this inventory control system on a single press. This has the advantage of giving everyone time to assimilate the new ideas, and to react, and to add their comments and suggestions.*

These organization principles and practices should be common sense. Just imagine you are a building roofer. How many times do you need to climb down and back-up, if all the tools you used and the roof tiles, were stored on the ground in-front of the house? Of course, this does not make sense. Roofers have all their tools either in a tool belt or on a platform beside them on the roof as they work. In fact, the standard practice is to first pre-position all the stacks of roof tiles evenly across the roof, so there is minimal effort during roofing to get to everything they need.



- *Where necessary tools must be duplicated, and where possible fastened in position using a retractable, spring loaded wire or nylon hawser. This will ensure the tools are where they are needed, when they are needed, and it will be impossible to inadvertently remove a key tool from the work area.*
- *It is an advantage to pre-plan the pre-positioning of tools, equipment, materials and parts in each work area, however, it usually proves effective to implement the set-up*





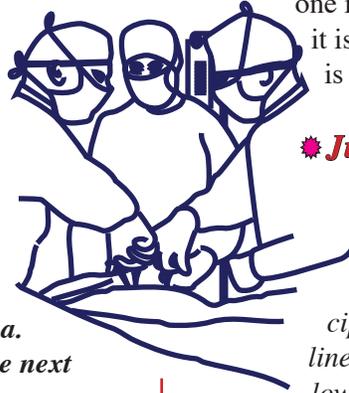
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"He who sacrifices his conscience to ambition burns a picture to obtain the ashes." Chinese Proverb

over several changeovers. This is important as planning on-paper is rather different to the actual process on-press. It will usually take several sessions to fully customize a work area.

→ It is also an advantage to work on one area, to minimize any potential disruption, and also to expedite the completion of one area. When the first area is complete, the next area can be started.

→ Naturally, when the Inventory Control organization of each work area is complete, the area should be mapped, on paper and on videotape, with every tool, every material, and ever component position identified and marked. (In practice an area is never completely finished as progressive changeover cycles will reinforce the optimal layout and expose changes to improve utilization of the area.)

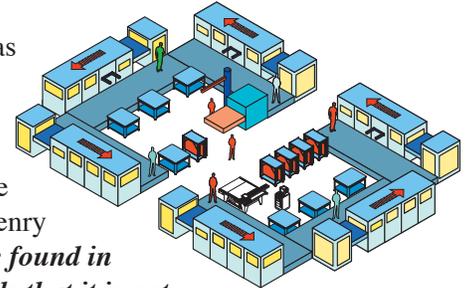


one involved that this is more effective, it is safer, it is easier, it is less stressful, and ultimately, it is a more productive way of doing things.

✿ Just-In-Time Organization

Common Sense states that... time is our most expensive and our most volatile resource, and Just-In-Time provides the discipline to stabilize, to standardize, to streamline manufacturing to produce parts at their lowest cost, to minimize the consumption of all resources, particularly labor, and to manufacture in the shortest time. "Waste can be defined as anything other than the minimum amount of equipment, material, parts, tools, space, and the worker's time, which are absolutely essential to add value to the product." Fujio Cho

Just-in-Time was first emerged in the Ford manufacturing revolution in the early 1920's. Henry Ford; "We have found in buying materials that it is not



worth while to buy for other than immediate needs. We buy only enough to fit into the plan of production, taking into consideration the state of transportation at the time. If transportation were perfect and an even flow of materials could be assured, it would not be necessary to carry any stock whatsoever. The car-loads of raw materials would arrive on schedule and in the planned order and amounts, and go from the railway cars into production. That would save a great deal of money, for it would give a very rapid turnover and thus decrease the amount of money tied up in materials. With bad transportation one has to carry larger stocks."

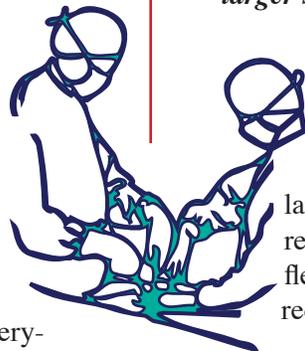


This is not a difficult concept, nor is it a difficult project to organize, however, there is often a great deal of emotional attachment to the old ways of doing

things. Even when existing methods have clearly failed to stay in touch with current commercial or technical standards. As with all of these projects, the watch word is patience, followed by lots of communication and discussion!

The initial project should be described and discussed in detail with the entire work team, however, to limit the degree of chaos, which could be caused by everyone working on the project at the same time, it would be more pragmatic to limit the project to one press and to one press team.

In my experience, everyone genuinely believes their method of completing each diecutting activity, is the best method for themselves, the team and the company. It will require support, positive reinforcement, and ultimately discipline, to get through the first stage of what ever project is selected. Fortunately, the inevitable outcome of this project will be to convince every-



The next major breakthrough in Just-In-Time came at Toyota in the 1950's, when Chief Engineer Taichi Ohno recognized the assumption that these methods were only suitable for large volume manufacturing was incorrect. He realized that if the operation were made more flexible, they could reduce the overhead cost and reduce the economic lot size. This in turn led to





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"What we anticipate seldom occurs; what we least expect generally happens." Benjamin Disraeli

the development of Single Minute Exchange of Die at Toyota, when engineer Shigeo Shingo attacked the bottleneck problem of reduced lot or run sizes, by achieving rapid changeover from one production run to the next.

This minimalist approach to manufacturing eliminated anything which was not necessary to an activity, and it ensured that everything that was necessary, was in the right quantity, at the right place at the right time. Why is this so important in diecutting manufacturing?

As with all manufacturing, commercial pressure has forced a change in the way we price and cost our products and services. In the beginning it was simple. We added our costs and the profit we thought was fair to determine our price. Naturally, this Time plus Materials approach to manufacturing was safe and good for



the manufacturer. However, increased competition led to Market Driven Pricing, in which the price is determined by the market, and profit is calculated by subtracting cost from the price. This is obviously good for the purchaser. However, our ability to survive is predicated on adopting Productivity Driven Pricing. In this method Costs are specified by subtracting our required profitability from the price driven by the marketplace!

The reason it is called Productivity Driven Pricing is because we are, in the majority of situations, unable to set the market price. *See above.* Therefore, our profitability is a function of subtracting our costs from the market price to generate our profit. As the only way we can do this is by attacking and lowering costs, productivity and efficiency become the primary driving forces of everyday activity in diecutting.

The reason Just-In-Time techniques are so important in diecutting, is this is one of the most effective productivity tools to reduce operating cost.

Before describing the solution, it would be beneficial to describe an optimal

Time & Materials Pricing

COST + **PROFIT** = **PRICE**

Market Driven Pricing

PRICE - **COST** = **PROFIT**

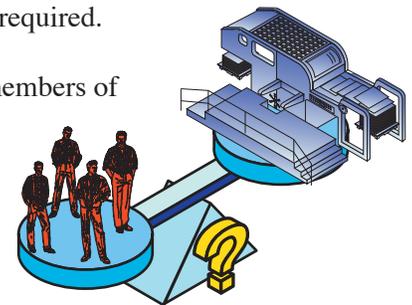
Productivity Driven Pricing

PRICE - **PROFIT** = **COST**

Just-In-Time organized workplace everyone is familiar with, from personal experience or from watching too many medical dramas. The example is the operating room in a hospital.

In this specialized environment every single item is pre-determined and pre-checked; everything is in optimal condition; everything is stored as close to the action as possible without crowding the activity; everything is stored in the identical location it was stored in as it was every other time the work area was used; every material, every supply, every tool, every piece of equipment, every piece of information, and every component, is stored in a predetermined location, and consistently applied location; everything that is needed is available and nothing that is not needed, the area is as compact as possible, but not so compact as to inhibit the activity; at the end of every cycle, the work area is purged, restocked, and prepared for the next emergency; during the activity the work area is restricted with only essential personnel admitted; every team player has a designated role and a designated position during the activity; and every team player understands the sequence of events and is ready on cue to provide the technical assistance required.

They also became members of this elite team after extensive training and education. This is the same as press changeover! You may disagree, but in



principle the only difference is the activity, the tools, and the skills being applied. The principles and the practices of how this room or work area is organized is identical to the principles and practices used to organize fast press changeover.

7 Waste Sources	
	Time
	Motion
	Processing
	Defects
	Over-Production
	Inventory
	Transportation

→ *The first step in any new project must be to get the entire work team together to describe the project, to outline the potential benefits of the change, to discuss the obstacles and challenges, and to brainstorm methods and practices for starting the project.*

→ *The work team should adopt the description*





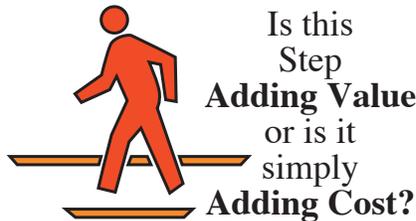
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"Every moment spent planning saves three to four in execution." Crawford Greenwalt

of the Hospital Emergency Room as the model for the reorganization of key areas of activity or work areas, on-press and off-press.

→ The work team should define the work areas or activity centers on press. These will include the operator side of the press, the off-lay or gear side of the press, the end of the feeder and the end of the delivery. In addition, we must include the underside of a unit and the inside of a press unit. These work areas could include:

- * The Press Feeder
- * The Press Feedboard
- * The Platen Stack
- * The Platen Well
- * The Stripping Unit
- * The Blanking Unit
- * The Delivery
- * The Waste Extraction System



→ The next step is to prioritize these work areas or work cells, for Just-In-Time Calibration. My suggestion would be to begin at the Platen Stack or Diecutting Section as this is where the majority of work takes place.

→ With the specific work cell selected, the organization of the work area can begin. This requires listing everything required to complete the activity, and without leaving the work area. This would include:

- * Job Information & Storage
- * All Hand Tools
- * All Power Tools
- * All Power Outlets
- * All Air Outlets
- * All Converting Tools
- * All Materials
- * All Supplies
- * All Parts & Components
- * All Equipment
- * All Safety Gear
- * All Maintenance Equip-



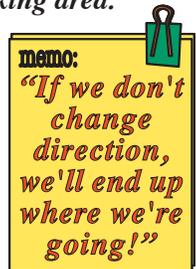
ment

- * All Maintenance Supplies
- * Any First Aid Supplies

→ The principle here is once you have started an activity, there should be no reason to leave the work cell other than for a scheduled break, a toilet break, or a personal emergency. Walking to get information or looking for a tool is a non-value added activity, which must be eliminated and most certainly converted from an on-press activity, an Internal activity in SMED, to an off-press activity, and External activity in SMED.

→ One of the disadvantages of the standard press platform is it is often too small to properly organize and to execute a team make-ready. By rotating one adjoining press or by extending the standard press platform, we can create a more effective and a safer working area.

→ The next step requires creating an accurate map of the press and the surrounding areas, particularly if these areas are involved in press changeover, or are used as staging areas for new and old tools. The map should be executed on graph paper, or directly programmed into a CAD System, using a scale such as 1/4" per foot.



→ The next step requires using the map to position all of the tools, supplies and components which will be used in make-ready. There are two options here. They can be permanently located in single source, color coded or shadow box locations, or they can be transported in on specially designed tool, equipment and materials carts, which are pre-positioned by the pre-press team. The advantage of the mobile cart system, is each cart can be customized precisely for each press make-ready, and it can be returned to the pre-press area, where the cart can be purged and replenished for the next make-ready.



→ It is important to remember to use pull down overhead tool and material holders. Many companies utilize this technique to have the tools and materials instantly accessible, and the counterbalanced toolholders can be



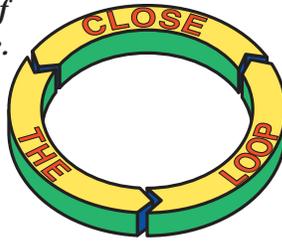


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"Good results without good planning come from good luck, not good management." David Jaquith

pushed upward and locked out of the way when they are not in use.

- An important point in this organization system, is that personal tools are not allowed. If everyone had their own tools we have immediately given up standardization and consistency. Have you ever looked inside one of these toolboxes? Tools are mixed together in a chaotic mix of different implements and because the toolboxes are not organized with color coded, single source or shadow box locations, retrieving and searching for missing tools consumes 5 to 10 minutes every make-ready. Five minutes may not seem a great deal of time, however, if we do one changeover per shift on three shifts, and we work 5 days per week, that is one hour and 15 minutes per week, and 64 hours and 30 minutes per year.



- Where necessary tools must be duplicated, and where possible fastened in position using a retractable, spring loaded wire or nylon hawser. This will ensure the tools are where they are needed, when they are needed and it is impossible to inadvertently remove a key tool from the work area.

- One of the interesting modifications made to Western equipment by the early Japanese pioneers of Just-In-Time, was to modify all of the heads of the bolts, and all of the sockets of the Allen bolts to have the same size bolt head or the same size Allen wrench. We would



probably describe this initiative as not worth the effort, but having a single tool, spanner at one end, and an Allen key for the other end, saved sufficient time from every press set-up, to pay for the expenditure in a matter of weeks!

- It is an advantage to pre-plan the pre-positioning of tools, equipment, materials and parts in each work area, however, it usually proves effective to implement the set-up over several changeovers. This is important as the planning on-paper is rather different to the actual process on-press. It will usually take several sessions to fully customize a work area.

- It is also an advantage to work on one area, to minimize any potential disruption, and also to expedite the completion of one area. When the first area is complete the next area can be started.

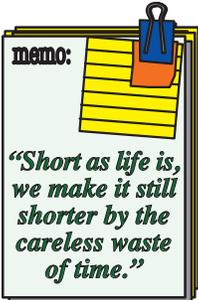
- Naturally, when the Just-In-Time organization of each work area is complete, the area should be mapped, on paper and on videotape, with every tool, every material, and ever component position identified and marked. (In practice an area is never completely finished as progressive changeover cycles will reinforce the optimal layout and expose changes to improve utilization of the area.)

Five minutes every make ready is an enormous block of time, and in this very conservative estimate, it means we lose one press for all most 8 shifts per year! This is simply not acceptable!

- Remember an important requirement of efficient high speed manufacturing. You can do this job any way you want as long as you all do it the same way!

When we allow personal tools we are allowing the process to be undermined by all of the different ways and inconsistencies, people bring to their personal discipline. This is now a team approach and everything must be consistent. So the personal tools are out!

- The positioning of tools and materials is critical. Every step we take, every time we reach for a tool, consumes the base time block of time management, 6 seconds. Also we defined transportation as one of the potential waste sources in manufacturing. Therefore, all of the tools, the materials, the components, and the parts must be positioned as close to where they will be used as possible.



memo:

"Short as life is, we make it still shorter by the careless waste of time."

"Waste can be defined as anything other than the minimum amount of equipment, material, parts, tools, space, and the worker's time, which are absolutely essential to add value to the product." Fujio Cho - Toyota

The goal is to be able to start each make-ready with everything pre-positioned, so every part, tool, materials, supply, piece of information, and components are on-press. It is estimated that more than 25% of the activ-





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"If you can't beat 'em, confuse 'em." Harry S. Truman

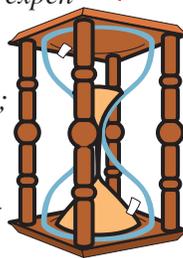


ity in an average press make-ready is non-value added time consumed in looking for tools, getting materials and equipment, verifying information, replacing damaged parts, and relocating misplaced parts!

As you can see this is not a difficult project to organize, however, the steps and the progress will be slow, as everyone in the work teams learn to think in terms of value added time and non-value added time. And to return everything back to where they got it from!

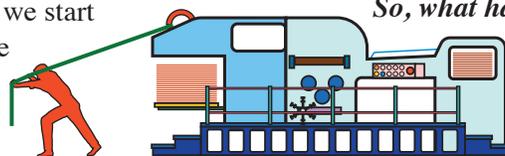
Time Management

Common Sense states that... time is our most expensive and our most volatile resource, and it is essential to develop a system of manufacturing built around benchmarked time standards; and to use the measurement of activity time and elapsed time, to simplify, to accelerate, and to streamline the process and every activity, to reduce resource waste, to reduce non-value added time consumption, to improve quality, to increase productive output, and to reduce operating cost. "We work not only to produce but to give value to time." Eugene Delacrois



One of the few guarantees in life is the equality of time. Everyone, from the rich and famous, to the poor and the unknown foot soldier, receives an identical daily allocation of seconds, minutes and hours. The great unknown of course, is how and when this resource will become superfluous, as we are no longer here to *spend* our time. The recognition of the irreplaceable volatility of our time and our lives, adds to the stress and frustration of daily living, as we try to *"manage & control"* this resource. Unfortunately, a quote by Henry Austin Dobson illustrates our dilemma; *"Time goes, you say? Ah, no! Alas, Time stays, we go!"*

The majority of us are experiencing a daily increase in things-to-do, while there is a seemingly steady decline in the time available to complete each task. We seem to be working faster, and harder, we start earlier and work later, and yet the morning's project list has not only not decreased by the end



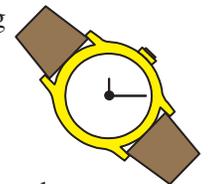
of the day, it has become longer! In fact more than 200 years ago Benjamin Franklin observed; *"Dost thou love life? Then do not squander time, for that the stuff life is made of."*



Our daily conversations and our professional dialogues are full of time references. These may include: *"Man time; time out; down time; start time; lost time; cycle time; break time; time and a half; just-in-time; up time; Pacific time; on time; overtime; value added time; travel time; and delivery time, just to mention a few."*

In addition our language and terminology contain time based measurement or references. These would include *"Speed to market; resiliency; happy hour; sunrise and sunset; late delivery; benchmark; parking meter; miles-per-hour; turnaround; press speed & yield; schedule; and of course, weekend."*

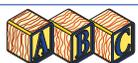
These constant reminders of how important time is in our life, adds to the challenge and the pressure to do better. As we are constantly reminded, we need to *"Manage Time."* The title of this section of the manual is Time Management, but the reality is it is impossible to manage time. *"Time Management"* is not about managing or about controlling time, but rather about managing and controlling our activity, and using the passage of time, as a measurement of our efficiency and of our effectiveness.



So why is this a big deal in diecutting and converting? Making the best use of the time you have has been a universal theme since the beginning of recorded history. However, things have changed, the products and the processes are more complex, the technology and the system of manufacturing is faster, and the man time or man hour resources available to handle the increased volume has and is steadily decreasing.

So, what has happened?

In many ways the basic structure and the focus of converting has remained unchanged, however, the economic





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"Don't part with your illusions. When they are gone, you may still exist, but you have ceased to live." Mark Twain

environment we work in, and the market we serve has very different and constantly evolving expectations of performance. For example, while quality control and quality management has been the driving force of our industry, the focus now is on "Speed-to-Market." This simply states that customers want the quality and the consistency of the folding cartons and fluted containers you are producing, but they want it faster and in the shortest time possible. And of course, as they know speed in diecutting lowers the cost of manufacturing, they also want it cheaper.

Traditional Measurement	Time Based Measurement
✔ Cost is the metric	✔ Time is the metric
✔ Look to Financial Results	✔ Look to physical results
✔ Utilization-oriented measures	✔ Throughput-oriented measures
✔ Individual measurement	✔ Team based measurement

In the traditional measurement Cost was the driving force, and we constantly referred to financial measurement to assess performance. However, in the modern manufacturing operation, time is the driving force, and we look to physical results, turnaround and throughput, as the measures of performance. See above. This transformation has proved very beneficial to all manufacturing as it has forcefully demonstrated that

	Time is a more useful and a more accurate management tool than cost.
	Cost is normally a symptomatic, after the fact, lag indicator of productive efficiency.
	Time based companies reduce cost indirectly by compressing time.

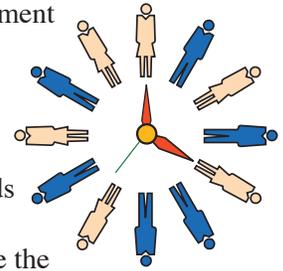
Time is a more useful and a more accurate measurement tool than Cost. While this approach still values the importance of cost control and management, it does recognize, that the traditional cost measurement system was a symptomatic, after the fact, measurement of performance. See above.

So, what is the bottom line?

To make the transformation to "Competing Against Time", we have to accept time management as the critical measurement tool, and we



have to integrate time measurement into every key activity.



To implement an effective system of time management, designed to provide the methods and the measurement practices, to analyze and to improve the process, we have to follow a simple but essential step-by-step program. In the several sections of this manual we have discussed in detail time based measurement systems, such as Key Result Analysis, Just-in-Time organization, and Single Minute Exchange of Die. However, time management is about activity organization, management and control, and this must be our starting point.

To implement this improvement initiative we need to execute the following actions:

- ➔ *The first step in any new project must be to get the entire work team together to describe the project, to outline the potential benefits of the change, to discuss the obstacles and challenges, and to brainstorm methods and practices for starting the project.*
- ➔ *It is important to list and to prioritize key activities, with the goal of choosing one activity to be the proving ground for subsequent activity reorganization and benchmarking.*
- ➔ *Although we are strictly not ready to use time management as an effective analytical tool, it would be useful to time several cycles of the selected activity, and establish an average benchmark. This will give the work teams experience in the techniques and the procedures of time measurement, and in the decisions regarding the start and end point of each activity.*
- ➔ *The next step is accomplished by working with the project teams to stabilize and to standardize the work area, in which the activity is performed.*
- ➔ *This first step in standardization may require listing all of the tools, materials, equipment, supplies, information and components, which are required to complete the activity, and*





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"The way to gain a reputation is to endeavor to be what you desire to appear." Socrates

establishing a checklist for pre-preparation and positioning everything needed to complete the task.

→ The next step is to list and prioritize the sequence of procedures, which are used to complete the task under analysis. This could obviously be a single procedure or it could be a series of sequentially executed procedures.

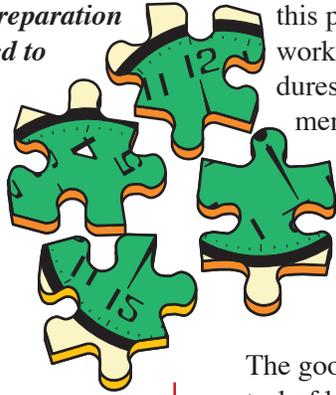
→ As part of the standardization of the work area and the procedures executed in the work area, it is obviously important to define current performance measurement and/or to devise measurement based upon activity criteria and time. For example, although we can use time measurement to determine activity time and elapsed time, this would have

to work in conjunction with measurements such as quality. We can time the transfer of counters, however, the most important measurement would be tool-to-tool alignment and folding performance.

→ The team would then execute several cycles and measure time performance, against the original standard. However, too much emphasis should not be placed upon the time, as at this stage the most important ingredient is to give individuals and teams the time to learn the new layout of the work area, and to fine tune the layout and the standardized procedures they are executing.

→ As the team gains experience in the use of time in terms of added value and non-added value, in terms of just-in-time organization, and in organizing the layout of the work area to minimize travel time, the benefits will accrue in faster processing and greater consistency.

→ To maximize the full benefit from all of these process improvement activities it is useful to use a facilitator as an observer, a recorder, and as a timekeeper.



this project, the heavy lifting is in standardizing the work area, the tools and supplies, and the procedures used to execute the activity. Time measurement or time management becomes most useful when the standardization has progressed to the stage that the use of time measurement becomes one of the important factors in selecting the most appropriate step or action in the activity.

The good news is time measurement and time control of key activities is neither complex nor difficult, however, the primary challenge, and the perennial obstacle to the faint of heart, is the need to stabilize and to standardize the activity. Time measurement will provide the feedback we need to adjust the process, but the process must be executed consistently for the use of time measurement to be effective and/or valid.

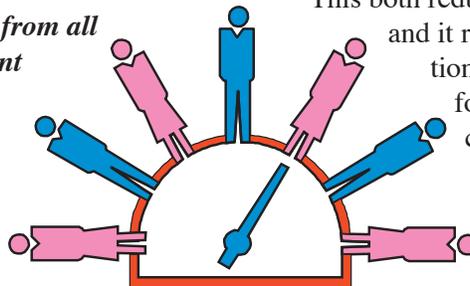
As we have described in earlier sections, one of the most powerful tools in process improvement is the standard Video Camera or Digital Camcorder. This is not only invaluable in showing the before and after, it is much easier for individuals and teams to evaluate their own performance when they can observe the activity away from the stress and the pressure of execution.

The advantage of the modern digital camera equipment, and in fact some of the older video cameras, is they can be set to show the elapsed and activity time for the events they are recording. The modern digital media is particularly useful in this application, as the files can be downloaded to a computer to simplify access and viewing, and to allow maximum flexibility in reviewing the activity.

This both reduces the complexity of timekeeping, and it reinforces the validity of the information captured. In addition, there is no need for a professional videographer as these cameras are simple and easy to use, and it adds great validity to the process improvement initiative if one of the team records the activity.



As you can see from the steps in

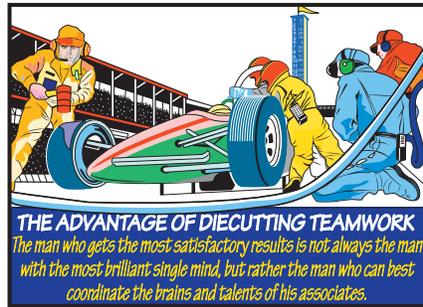




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"What lies behind us and what lies before us are tiny matters compared to what lies within us." Ralph Waldo Emerson

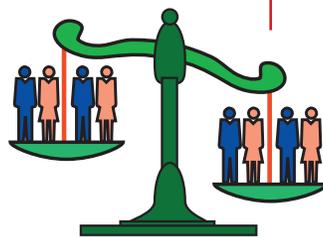
technology, and we are in danger of steadily losing the Speed to Market race unless we are prepared to find radically better techniques and procedures. Complicating this challenge is the reality of working with less resources, less time, and less opportunity to recover from any mistakes or production bottlenecks.



The challenge we face, is we are struggling with traditional methods and practices, which although they can be marginally improved, lack the flexibility to make and to sustain rapid and continuous daily improvement. As it has consistently proven difficult to transform the current system of manufacturing into an efficient, and a productive diecutting operation, it is obviously necessary to consider a different, and a more effective approach.



The keys to the new discipline are based around an understanding and the implementation of **Time and Motion and Just-In-Time Principles**, and an adoption of a more effective organization structure for preparation and execution of press changeover. These include the discipline of organizing, using the principles and practices implemented in a **Hospital Emergency Operating Room**, and by adopting the competitive team changeover principles and practices used in a **NASCAR or Auto Racing Pit Crew Changeover**. These can be, and they should be, implemented gradually, with daily practice improving performance and competence in these basic and very understandable disciplines.



An important element of making these changes must be a recognition that a meticulous and a continually improving preparatory checklist is vital to faster and simpler changeover. In addition, it is essential to accept that the diecutting press is merely a toolholder, and the foundation of effective diecutting is effective tool specification, design and fabrication of precisely synchronized tooling.



In practice, this requires a greater integration of the diemaker and the pre-press technician, and the primary architect of diecutting and toolmaking success, the CAD CAM/Structural Design Team. Which brings us to the fundamental importance of teamwork in the new system of manufacturing. The current method of press make-ready is primarily an

Incremental Process, in which a series of predictable tasks are executed in a sequence, one after the other. This method of working is neither time efficient nor does it utilize available resources effectively. The alternative is the **Simultaneous Process**, in which a team of people, with pre-determine duties and responsibilities, execute a series of pre-determined activities, in a coordinated and a choreographed manner, designed to changeover in 30 minutes or less!

Is this possible? Yes it is. Will it require change to the current system of manufacturing? Yes it will. Is it difficult to implement? It is not difficult to implement, however, it will take time for the work team to adopt, to accept, and to become adept in the new methods and procedures.



Realistically we have little alternative, but to adopt a system of manufacturing which has demonstrated considerable productive advantages, over the current approach to diecutting manufacturing.

The potential solutions for press changeover are suggested in a graduated progression, from basic, to intermediate, to advanced. Simply stated these suggestions for organizational change range from those requiring minimal effort and disruption, and being capable of fast implementation, to those which require planning, training, and practice, and will require a longer term to perfect the skills.

Using a variation on these different operating methods, some companies start with the basic changeover reorganization and gradually progress through the other options as the workforce gains experience and confidence.

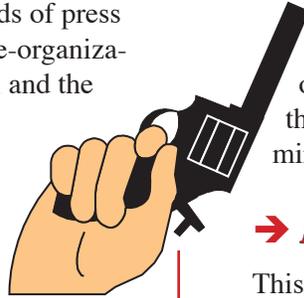




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"Invincibility depends on one's self; the enemy's vulnerability on him." Sun Tzu

It is important to note all of these methods of press changeover are based upon a thorough re-organization of the press, the tools, the materials, and the supplies, in a Just-In-Time and off-press organization discipline. These principles and practices defined in earlier sections of the manual describing Time Management, Just-In-Time Organization, Single Minute Exchange of Die, Inventory Management, Simplification and Pre-Press Organization, will make a significant productive impact on press changeover, if nothing else is changed. However, when you consider the breakdown of Non-Value Added Time as compared to Value Added Time, it is vital to customize the press and the work areas to make press changeover as simple as possible. Stabilize, Standardize, and Streamline.



organized tool belt or harness. However, do not under-estimate the importance of this first level of change, this type of re-organization has proven the ability to reduce changeover time by 15 to 45 minutes!

→ Level Two

This is one of the more common techniques used in Europe. Two crafts people in the department are selected as changeover specialists, and rigorously trained in all of the key techniques we have specified. Their primary role is to prepare for, to assist the operator, and to complete a technical close out of every press changeover. The information they collect is obviously recycled and used to continuously improve standard methods and practices, however, all of this information is purged weekly and documented to ensure it is recorded and integrated into standard operating procedures.

An obviously important component of this position is training and re-training, and research and development, as they work to improve methods and practices, and assist the operator to develop more productive working habits. Generally, only one specialist is on duty at one time, while the other is running a press or working in a pre-press discipline, however, they should swap positions every two weeks. Naturally, the more technicians qualified to perform this function the better, and it should be a goal of this method to raise the knowledge and the skill of everyone involved.



→ Level Three

This is a variation on Level 2 where the press operator is assisted by two changeover specialists. This can be accomplished by training 4 individuals, with two on-duty, and two ready to replace them on a two-weekly basis. The advantage of this approach is simply logistics.

For example, on a sheet fed press it is necessary to remove the old tools and install the new die and counter set, the male and female stripping tools, and the male and female blanking tools. If this is completed incrementally, and each consumes 15 minutes *Activity Time*, we have a total of 45 min-



Make Ready



Time!

So each of the alternative strategies that follow, all require a determined and dedicated attack on all of these critical issues, before we consider changing the operating structure of the on-press changeover activity. One further important point. Everyone involved in press changeover must be wearing a customized tool belt which contains all of the commonly used tools required for press changeover. This simple, but critically important change to standard procedures will reduce Non-Value Added Time by a minimum of 10%.

Assuming we have completed the basic reorganization of the press and work areas, how can we reduce changeover time?

I recommend eight (8) levels or re-organization strategies to reduce the time required to change a press from one job to the next.

→ Level One

This is simple, and the easiest to execute. Assuming we have completed all the work re-organization tasks specified on the previous page, we have customized the work areas, and we have eliminated the need to look for tools, components or supplies, then we proceed with a one person make-ready. This also assumes the use of a well

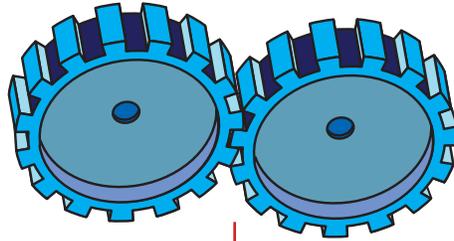




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"Yesterday is but today's memory, and tomorrow is today's dream.--" Sun Tzu

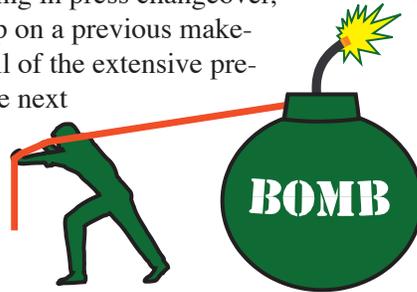
utes **Elapsed Time**. However, with the operator and the two person changeover team, these activities are completed simultaneously or in parallel to one another. We still have 15 minutes **Activity Time** for each tool changeover, however, our **Elapsed Time**, or the press down time is only 15 minutes. In Single Minute Exchange of Die, this is referred to as Parallel Processing, which simply means a team of people are completing cooperatively several tasks at the same time.



the tools more effective. This could include a member of management, so they can fully understand and appreciate the challenge facing the press operators.

These experiences are valuable to the entire operation, as this training in this critical activity will enable everyone involved in the process to more fully comprehend the changeover battleground, and to be responsive and focused on the needs of the press team.

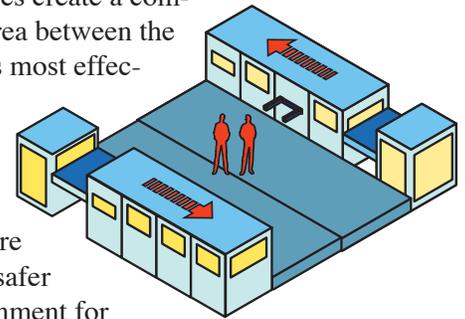
The question is often asked; **"What are these people doing when there are no press changeover's?"** There can be several answers to this. In most situations the changeover specialists are our pre-press team, and when they are not assisting in press changeover, they are closing-the-loop on a previous make-ready, and completing all of the extensive preparatory activities for the next several press changeovers. Naturally, there are many other duties including training and re-training, research and testing tool and converting parameters, tool rework and tool management, liaison with external and internal suppliers, information management and inventory management, and a host of other activities, designed to minimize on-press time.



→ Level Four

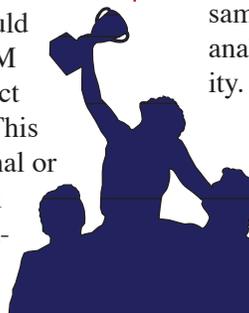
This is where we begin to reorganize the workplace to more effectively utilize our manpower resources. The Traditional Workflow consisted of each press aligned in the same direction and often positioned side-by-side. This outdated layout of equipment creates barriers to cooperation, it prevents either operator responding to the needs of the other operator or to be able to monitor the press as it runs, and it undermines teamwork and the idea of shared responsibility.

In the **Advance Workflow Layout** for presses, one of the presses is rotated 180 degrees, so the platforms of the two presses create a common working area between the presses. (This is most effective, when one or both of the press platforms are extended, to provide a more effective and a safer working environment for press changeover.)



Level Two and Level Three are one of the most common approaches to fast press changeover, as the process of building and creating the teams is relatively straightforward, and relatively painless.

Note: Both Level 2 and Level 3 can and should be regularly augmented with a Flexible Team Changeover. This simply means the team of one, or the team of two, has a fully participating guest participant in the make-ready changeover sequence. This should include regular participation by a CAD-CAM person so they can fully appreciate the impact of their design and specification decisions. This should include the diemaker, either an internal or an external diemaker, as this experience will forcibly demonstrate the strengths and weaknesses of each tool set, and provide first hand guidance in things to change to make



This means the two operators form a team of two, whether by default or out of necessity. The changeover activity, unless both presses are in make-ready at the same time, is a cooperative venture, with long term analysis showing changeover to be a 1.5 person activity.

It is interesting to note that 30 or 40 years ago press operators were classified in two ways. Press Technicians, who could complete all the tasks in pre-press, and who could make-ready every press in the operation, and Machine Minders, who were

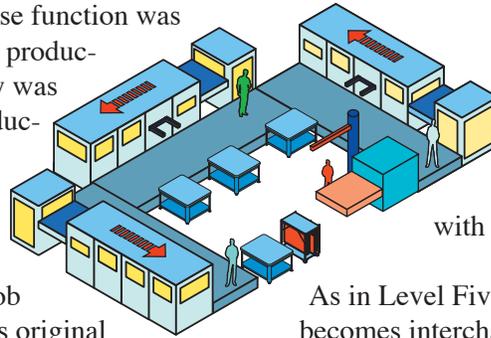




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"...if we wait for the moment when everything, absolutely everything is ready, we shall never begin." Ivan Turgenev

often in training or apprentices, whose function was to watch the press and deal with any production problem, after press make-ready was complete. In fact, if there was a production stoppage, which was complex to diagnose, the Machine Minder responsibility was to fetch a Press Technician who would fix the problem, provide some fast on-the-job training, and who would return to his original duties. Most operations had approximately three Press Technicians to seven Machine Minders.

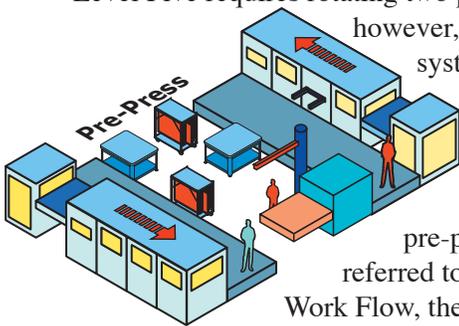


ever, instead of two presses, three presses are aligned around a central core of the pre-press discipline. This is generally a four person work team, however, many organizations implement this Modular Work Flow with only a three person team.

Naturally, this layout would be an advantage to the recommendations of Level One through Level Three.

→ Level Five

Level Five requires rotating two presses as before, however, in this attack on the system of diecutting manufacturing, sufficient space is left between the presses to accommodate a pre-press discipline. Often referred to as a Just-In-Time Work Flow, the manning of this work unit consists of three technicians, who after a period of training are capable of performing all of the functions of diecutting and pre-press.



As all of the platforms and the work areas are at the same level, it is possible to observe both presses and the work in pre-press from any vantage point in the work cell. This results in having 3 or 2 personnel available for each press changeover, depending upon the flow of work.

This is a highly effective team environment, in which education, research, and skill development are inevitable outcomes. The three personnel share all of the responsibilities of maximizing productive output, however, one member plays the role of team leader, a role which should rotate between the three team members on a monthly basis.

→ Level Six

Level Six provides a similar work environment, how-

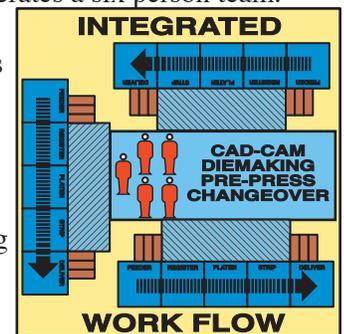
As in Level Five the goal is that every team member becomes interchangeable, and this work environment lends itself to rapid education and to fast skill development. As in Just-In-Time Work Flow, the position of Team Leader can rotate between team members, however, the timing of the rotation for this work system is usually every three months.

Most organizations begin this process with a four man or five man team, however, as the team gains competence and confidence, it is quickly apparent the additional team members are no longer essential to running this efficient system of diecutting manufacturing.

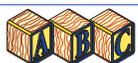
→ Level Seven

Level Seven is a progression from Level Five and Level Six, however, the major change in this work organization method is two diemakers and two diemaking workstations are integrated into the pre-press discipline. This generates a six person team.

The long term goal of this team is interchangeability between every team member, however, the primary benefit of the integration of the diemaking team is the improvement of the tooling as a result of the knowledge gained by participating in press changeover, and in pre-press activities.



As this represents a more complex system of manufacturing, team leadership is usually fixed, however, two personnel are constantly trained to provide back-up and coverage for the team leader position. The long term goal is to teach the diemakers diecutting, and to teach the diecutters diemaking. The benefits gained by this inevitable exchange of knowledge and skill is the ability of the entire team to build and sustain a high





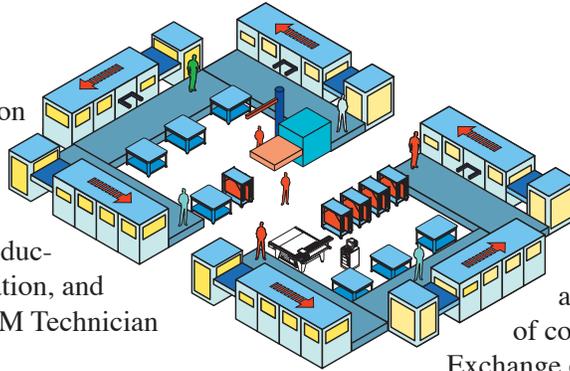
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"Patience and perseverance have a magical effect before which difficulties disappear and obstacles vanish." Adams

output work unit.

→ Level Eight

The final step in this progression is to create a layout similar to Level Seven, however, the major innovation in this system of working, is the introduction of a CAD-CAM Work Station, and the introduction of a CAD CAM Technician to the work team.



procedures, and then by benchmarking and streamlining on-press activity, we are making the current system of changeover faster, better, and simpler, without making major changes in organization or in manning. Converting as many On-Press Activities to Off-Press Activities is a simple and a powerful exercise, and of course it is the basis for Single Minute Exchange of Die. (SMED).

This system of working closes the knowledge loop in diecutting as the CAD-CAM technician and the diemakers are directly involved in the system of manufacturing they design and fabricate tools for. The rapid education of every member of this team leads to almost daily innovation in structural design, in layout, in toolmaking, in press-changeover, in press production, and in converting quality.



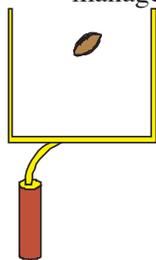
Team leadership is generally a fixed position in

this system of working, however, the supervisory or team leader position is still one of active participation in every activity involved in the system of manufacturing. This is an excellent format for training for every position, and it is an excellent system for converting the diemaking skills into Computer Tool Design Skills, and ultimately Structural Design ability. The primary goal is fast press changeover, and maximum productive output, however, the secondary benefits of daily training and skill development are key benefits of this approach to diecutting manufacturing.



- **Efficient Parallel or Simultaneous Processing.**
- **Faster completion of key tasks.**
- **Rapid knowledge, skill & experience sharing.**
- **Greater Uniformity and Performance Parity.**
- **A Reduction in the stress and the fatigue of a challenging activity.**
- **More effective standardization, simplification and streamlining of key activities.**
- **Faster Problem Solving and more effective innovation and progressive improvement.**
- **A self regulating, disciplined, more focused work team.**
- **Progressively faster, better, simpler, and lower cost press changeover.**
- **Friendly competition between several changeover teams.**

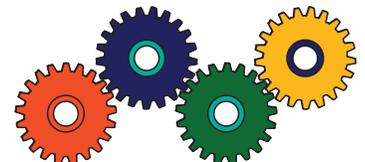
The great advantage of attacking the problem of fast press changeover, by working from one organization level to the next, is progress from One to Eight can be managed and controlled based upon the developing skill and experience of the work teams.



In fact, the first stage, Level One, is simply an exercise in common sense.

By stabilizing the current process, by standardizing and unifying existing

These are obviously the benefits of effective teamwork in any activity, however, it would

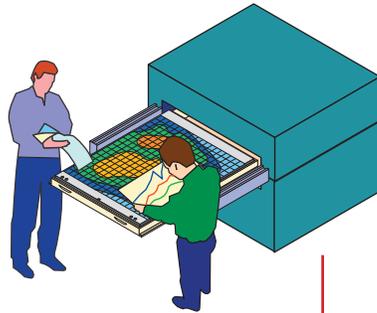




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"Nothing is built on stones; all is built on sand, but we must build as if the sand were stone." Jorge Luis Borges

be naive to think these benefits will accrue from day one. The key to any effective team is Practice, Practice, and more Practice. If you are determined to be successful it is essential to invest in team building.



For example, bringing the entire team in on a week-end to make-ready a typical job, then changeover to the next job, then changeover to the next job! With facilitators and team members monitoring and videotaping the activity, the practice day should end with a discussion of what happened, what worked, and what did not work! This is your Superbowl Team, and the last team to win the Superbowl invested a great deal of time in planning, in practice, and in an evaluation of what happened, and the Superbowl was not their first game together.

Remembering our Mission of Safety-Speed-Quality & Cost, if not for any other reason than the safety of the work team, extensive practice time is critical. And realistically, this is a key part of the investment necessary to build a winning Changeover Team!

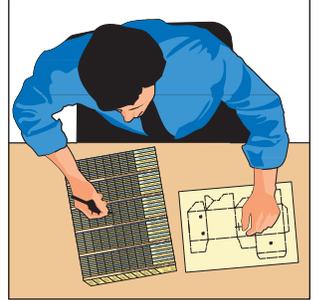
One Touch Tooling

Common Sense states that... it is statistical reality that more than 80 percent of press down time is associated with on-press tool adjustment and modification. Therefore, it is the mission of the Computer-Integrated-Manufacturing, diemaking, pre-press and diecutting work teams to analyze the customer product and application; then specify, design, machine, fabricate, and finish the integrated and synchronized male and female converting tools, to install and register seamlessly, and to require no on-press adjustment other than positioning and Z-Axis adjustment. Every press cycle should be used to identify, isolate, and eliminate one cause of on-press tool rework.

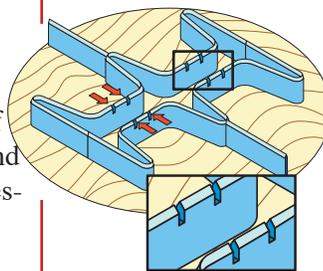


When purchasing a steel rule die, female creasing tools, or stripping & blanking tools, you are investing in two distinct but hopefully integrated disciplines. The first is knowledge, skill and

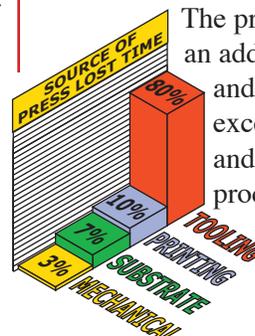
experience in diemaking and toolmaking. The second is knowledge, skill and experience in diecutting. You are also making the dangerous assumption, that your toolmaker is enthusiastically dedicated to converting excellence, and recognizes that the pursuit of expertise in diecutting is the foundation for mutual diemaking and diecutting success.



Naturally, you should eliminate this lottery approach to diecutting by creating and continuously updating the most valuable tool in diecutting, a detailed specification of how the die will be designed, machined, fabricated, and finished. With this blueprint for success, the diemaker simply has to follow your detailed and clear instructions, and toolmaking becomes the simple and easy process it should be.



The analysis, specification, & design phase of the toolmaking process should focus on developing and continuing to develop such a comprehensive, an effective, an understandable, and a comprehensive toolmaking blueprint, that once each tool is completed, there should be no further work required. This approach to tool design and manufacturing should result in the diecutting customer simply installing, registering, and synchronizing tools on-press, and then adjusting the Z-Axis or stroke distance between the tooling. If indeed there is a need for additional work on a tool, for example adding a nicking pattern to the steel rule die and then adjusting the ejection pattern to match the machined nick positions, this must be completed in a pre-press discipline.



The press must not be regarded or accepted as an additional toolmaking, tool modification, and/or tool repair station. Unfortunately, by excepting and even expecting additional die and tool modification or rework on-press, productive standards in both diemaking and diecutting have fallen, and the statistical reality, *see left*, of the breakdown of press lost or non-productive time has

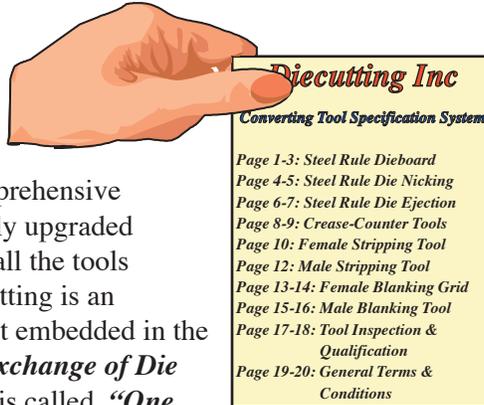




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"You can outdistance that which is running after you, but not what is running inside you." Rwandan Proverb

become the status quo.



The concept of developing a detailed, a comprehensive and a continuously upgraded specification for all the tools involved in diecutting is an important concept embedded in the **Single Minute Exchange of Die** discipline, and it is called, **"One Touch Tooling."**

This approach requires implementing the following disciplines,

→ *It is vital that any on-press work on tools of any description is classified and accepted as a toolmaking failure by all participants.*



→ *A converting tool specification format and design and approval procedure for each tool must be developed and approved by all the participants. (The tool specification discipline should include the steel rule die, the female crease tool, and the male and female stripping and blanking tools.*

→ *One of the primary measurements of the success or the failure of the specification & design effort is the directive that tools should not require any on-press alteration, modification or rework.*

→ *The Make-Ready or Press Changeover discipline should include an aggressive and a systematic evaluation of how the tools performed in press-set-up, and what changes must be addressed in the next upgrade to the tool specification system.*

→ *The Diecutting Production discipline should include an aggressive and a systematic evaluation of how the tools performed in press production, and what changes must be addressed in the next upgrade to the tool specification system.*

→ *The Finishing & Cartoning discipline should include an aggressive and a*



systematic evaluation of how the diecut products performed in gluing & finishing, and in cartoning & packaging, and what changes to key tool parameters must be addressed in the next upgrade to the tool specification system.

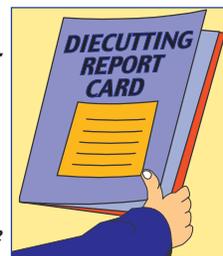
→ *As part of both Make-Ready & Production tool evaluation it is important to record how many times each tool was touched, the purpose of the activity, and how the specification could be amended to eliminate a repeat problem.*

→ *As part of both Make-Ready & Production tool evaluation it is important to identify, to categorize, to measure, and to prioritize changes based upon their consumption of on-press time.*

→ *This evaluation of tool specification and design, and Press Changeover & Production performance should be regularly discussed and brainstormed with the Internal & External Tool Suppliers.*

→ *To conduct an effective evaluation of tool specification and design, and Press Changeover & Production performance a member of the Computer Design Team and a member of the Diemaking Team should take an active, leadership role.*

→ *Tools which are saved for future production work should be subjected to an aggressive and a detailed standard inspection procedure, and any wear, damage, or "suspect" areas should be reworked before the next production run.*



To summarize One Touch Tooling, it is critical to recognize that the value in the discipline of effective tool specification and design, is that it represents more than 70% of on-press make-ready. You get this right, make ready will be fast and easy, however, when you get this

wrong, press changeover will be slow and costly.

For example, if you are currently experiencing slow and inefficient press changeover, and poor press speed & yield, your tools, your tool specification and design discipline, and your selection of key tool parameters is fundamentally flawed.

The **Bottom Line** is unequivocal, any requirement to adjust, to modify, or to "fix" tools on-press must be classified as a failure in the specification, the design, the





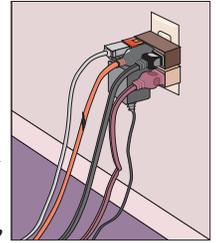
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"It's better to be boldly decisive and risk being wrong than to at length and be right too late." Marilyn Moats Kennedy

machining, and/or the fabrication of the tools. One Touch Tooling is an simple but an important mission in toolmaking and in diecutting. The tools should be touched in installation and deinstallation, any other tool activity reflects poor tool design & manufacturing.



tial error in the system of manufacturing is extraordinarily valuable, as it is a blueprint for process improvement, and it is an opportunity to systematically eradicate weaknesses and improve performance. **"A man must be big enough to admit his mistakes, smart enough to profit from them, and strong enough to correct them."**



Mistake Proofing

Common Sense states that... mistakes may be deemed inevitable, but the repetitive nature of the diecutting press lends itself to progressive problem identification, problem cause definition, problem solution development, and problem innovation, designed to continually reduce the potential for a process error, by systematically removing the causal factors. Every mistake is a flag which identifies a weakness in the system of tool design and fabrication, in the system of preparation, and in the system of changeover, and every incident must be recorded, prioritized and eliminated by "Mistake-Proofing" the system of manufacturing.

The following "mistakes" are examples of actions taken to eliminate on-press error, to save valuable on-press time, and to standardize tool specification pre-press preparation.

Mistake: Taking an impression for the patch-up sheet on-press.

Solution-Proof: Pre-preparing a patch-up sheet to exactly fit the chase back-plate in CAD-CAM.

Mistake: Adding Station Numbers to the Die

Solution-Proof: Pre-preparing the Die Design to include etching the station numbers.

Mistake: Adding Station Numbers to the Patch-Up Sheet

Solution-Proof: Pre-preparing the Patch-Up Sheet in CAD to include drafting the station numbers.

Mistake: Cutting & positioning Matrix on-press

Solution-Proof: Cutting & positioning Matrix off-press, with a sheet of shrink-wrap or paper stapled to the die to protect the matrix strips.

Mistake: Spraying fiberglass counters individually and positioning them on-press.

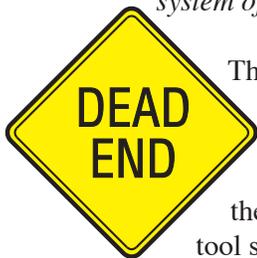
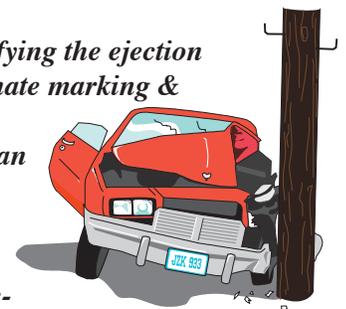
Solution-Proof: Positioning the counters on the die off-press, using a counter mask to spray & transfer the counters in a single impression, and by pre-calculating the pressure to transfer the counters.

Mistake: Nicking on-press & removing & replacing the ejection material.

Solution-Proof: Develop a systematic, consensus, and feed-back based system of off-press nicking & correct rubbering.

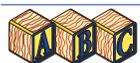
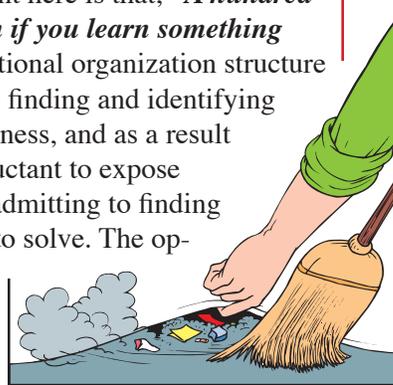
Mistake: Cutting & modifying the ejection pattern on-press to eliminate marking & shadowing.

Solution-Proof: Develop an effective, specified system of ejection and tool inspection and where necessary modify the ejection



The discipline of One Touch Tooling & Mistake Proofing are closely integrated, because as each failure in the preparation for production, in the work planning procedure or in the tool specification is detected, it is classified as a mistake or error in the system of diecutting manufacturing. By prioritizing the cost or consequences of each error, a solution for each failure is developed and "proven" through testing and approval before it is integrated into upgraded methods & practices.

Mistake Proofing is simply about the identification and the prevention of mistakes by eliminating them at their source. The important point here is that, "A hundred mistakes are an education if you learn something from each one." The traditional organization structure often inadvertently defines finding and identifying mistakes as a sign of weakness, and as a result many team players are reluctant to expose themselves to ridicule by admitting to finding a mistake they are unable to solve. The opposite should be true. The discovery and definition of every mistake or poten-





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"We promise according to our hopes, and perform according to our fears." La Rochefourauld

tion pattern off-press.

Mistake: Adding ejection strips to large panels to minimize air trapping and diecut part buckling.

Solution-Proof: Integrate this practice into a specification for ejection, to ensure this is completed off-press for every job.

Mistake: Eliminating Flaking & Edge Chipping on-Press

Solution-Proof: Assume Flaking & Edge Chipping are inevitable, and build the standard remedial modifications into every tool.

Mistake: Eliminating Dust & Loose Fiber on-press.

Solution-Proof: Assume Dust & Loose Fiber will occur on key knives and build the standard remedial modifications into every tool.

Mistake: Adding or removing or adjusting upper & lower stripping pins on-press.

Solution-Proof: Develop a more effective male and female stripping system using a more standardized approach to tool specification & design.



Mistake: Adding Flyers & Lifters on-press to the female stripping board to eliminate snagging.

Solution-Proof: Integrate the use of flyers, lifters and ramps into the specification system for the female

tool and include their fabrication and installation in the tool manufacturing cycle.

Mistake: Dealing with stripping part hinging, pivoting, and snagging on-press.

Solution-Proof: Implement a more effective specification & design system for stripping, which integrates "Multi-Level Processing."

Mistake: Removing and/or adding break-knives on-press.

Solution-Proof: Develop a more effective stripping tool specification system in which the position of break knives is both standardized and integrated into the tool design approval for each job.

Mistake: Dealing with Cracked Creases and adjusting Folding and Opening force on-press.

Solution-Proof: Integrate Reduced Bead Creasing Techniques into the crease/fold specification to eliminate these variables.



These are a some basic examples of the type of on-press "error or mistake," which was often incorrectly considered "Standard" on-press practices.

The definition of a mistake or an error is anything which undermines fast press changeover, which inhibits press speed and yield, which increases material waste, which lowers product quality and consistency, and which puts the safety of the operator at risk. The problem we face is that mistakes, errors, and on-press failure happen so frequently they have become institutionalized as standard procedures, and they are often overlooked as a source of productive improvement and progressive change.

In most operations the implementation of "Mistake Proofing" quickly identifies and categorizes more than 100 on-press errors, which consistently consume time, lower productivity, and reduce quality and consistency. Naturally, to implement these changes requires developing standards, it requires developing benchmarks, and it requires thinking laterally and out of the box.

"Success does not consist in never making mistakes but in never making the same one a second time."

George Bernard Shaw

❖ System Maintenance

Common Sense states that... at the center of an efficient converting-manufacturing operation is the diecutting press and it is vital the pre-press and the diecutting team implement preventative maintenance and maintenance activity; safety inspection and testing; cleaning and housekeeping; and just-in-time organization and inventory management control to ensure the press and the system of manufacturing is always in optimal operating condition. "I must create a system or be enslaved by another man's" William Blake.



The diecutting-converting process is in reality a continual experiment as we search (re-search), for simpler, faster, and better ways to manufacture cartons and containers. Naturally,





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at the right time.

To simplify the organization of these disciplines, it is obviously an advantage to choose one discipline, (Safety), and implement the System Maintenance for this activity.

STEP ONE:

→ Brainstorm the Safety discipline, and break it down into a list of the smallest executable step, task, or action.

→ This could be to test one guard, to verify one Emergency Stop Button, to verify the First Aid Procedures are in place, to check the Lock-Out Tags, to verify Safety Glasses are in position, etc. Safety means anything and every thing, which can impact or undermine the safety of the individual and the work team.



STEP TWO:

→ Create a short description for each step, which can be augmented by diagrams, digital photographs, or video thumbnail, and allocate a Key Word or an Identification Number/Code for each individual step.

STEP THREE:

→ Sequence each step, time each step, and determine repeats and the number of repeats.

STEP FOUR:

→ Identify the tools, the materials, supplies, information and resources required to complete each step. Determine a permanent or temporary on-press storage location for these materials. (These supplies would naturally fit into the Inventory management discipline.)

STEP FIVE:

→ Create a short Standard Operating Procedure for each step/action, should this be necessary. (Note if the task takes longer than five minutes it may be necessary to break the task down into smaller steps. However, if this is impractical, it will be necessary to schedule the activity independently, allocate the task to a non-changeover team member, or schedule the action as a separate activity.)



STEP SIX:

→ Choose a method of System Maintenance Documentation.

→ My recommendation is to use a card system, such as 5x8" Index Cards, which are stored in a plastic container, with appropriate dividers. Several people have chosen to use a Roladex type of system, and others have selected a system using smaller index cards.

→ Each card would document each basic step, in each discipline, and be stored in the sequence to reflect the frequency of execution.

→ Each card or each step should be given an identification of sequence number so it can be kept in place and/or reordered as the discipline expands.

→ One of the key advantages of the card system, is cards can be added, removed and reordered as necessary.

→ Changes, comments, or further actions can be added to a comment section on the card, and signaled with a post-it-note, for further analysis at the end of the changeover cycle.



STEP SEVEN:

→ Implementation is very simple. As part of the preparation for the press changeover, the next card/action in each discipline is lifted out and integrated into the changeover activity.

→ At the conclusion of the make-ready the card is replaced at the back of the set of cards in the appropriate discipline. In this way activities are continuously recycled, and obviously, if more repetitions of an action are required, a duplicate card is added.

→ If there is insufficient time to complete one or more of the disciplines, the cards representing the incomplete actions are replaced at the start of the cards in the appropriate discipline.

→ Each activity/card is checked with the date and the initials of the press technician to signal completion.

SUMMARY:

→ This is a very simple system, which is bullet proof in operation, however, even so, we recommend starting slowly, review and revise as necessary, and begin with as few as five cards/actions in each discipline.





→ If more time is needed for more changeover steps, then the changeover team can be expanded with someone who is part of the press team, but is not currently involved in press make-ready, whose primary responsibility is System Maintenance.

→ When possible, determine what tasks can be safely scheduled during press production, to minimize the impact on press changeover.

System Maintenance represents one of the simplest and yet most effective systems for building and preserving a World Class System of Diecutting Manufacturing.

Work Planning & Closing the Loop

Common Sense states that... the most efficient method of planning and control, Plan - Execute - Control - Evaluate, recognizes the importance of planning for every activity and for closing-the-loop to gain knowledge and skill from the experience, to improve planning and preparation for the next production cycle.

Therefore, it is vital to develop an effective plan of action; which maximizes the potential of all resources; which anticipates problems, obstacles and bottlenecks; which seeks to ensure everything needed to complete the planned activity is in the right place, at the right time, and in the right quantity; and to ensure this standardized method of preparation and evaluation is continually revised and upgraded, as performance in the activity is subsequently evaluated.

Every single recommendation, and every productive action specified in this manual requires precise, detailed pre-planning, meticulous organization, and checklist preparation. This is the most important recommendation in the manual, **because nothing will go to plan, if you don't have a plan!**



To a large extent the planning or re-planning process will be dictated by which of the disciplines and the priority of the disciplines, the planning development team determines to implement. For example, System Maintenance,

or Single Minute Exchange of Die, or Just-in-Time Manufacturing, require many things to be determined, many things to be organized, and many things to be put in place, before they can **begin** to be properly implemented.



In the beginning Work Planning is simply attempting to figure out what is necessary to prepare or to organize before an event, which will in turn ensure an efficient and an effective activity. Basic planning questions could include:

- What are we doing?
- Who is involved and how?
- How are we doing it?
- What do we need to complete the task?
- How will we measure success?
- What are the key constraints & benchmarks?
- Who makes decisions and why?

These and many other questions will need to be answered in the first phase of developing a Changeover Work Plan.

Implementing a Changeover Work Plan, is not an insignificant activity and it represents a major change to current methods and practices, and it represents a major upheaval for all the people involved. Therefore, it is important to be patient, to use a slow and a steady approach, and to make sure everyone involved or impacted by the change is given sufficient time to adjust and to get comfortable and familiar with the changes.

Therefore, to get the Changeover Work Planning initiative underway, and literally to prepare for the implementation of any and all of the disciplines outlined in the manual, we need to consider three (3) key initiatives.

1: Standardize & Stabilize Current On-Press Activity.

It makes little sense to develop a plan of action and ignore the experience, the knowledge, and the skills we have developed

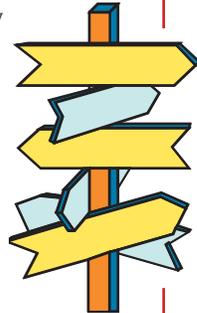


"No matter how high or how excellent technology may be and how much capital may be accumulated, unless the group of human beings which comprise the enterprise work together toward one unified goal, the enterprise is sure to go down the path of decline." Takashi Ishihara





so far. However, the problem with current methods and practices is they vary from individual to individual, and often from make-ready to make-ready with the same individual! The last thing we need is variation in methodology undermining the planning process. By randomly and inconsistently executing key set-up procedures, any performance measured, and actions taken, would be assessed on a false basis.



The next step is to begin investigating the technical problems and issues which undermine current changeover and production efforts. Therefore, step two is:

2: Implement a Pareto Analysis of On-Press Issues and Problems.

The majority of planning focuses on anticipating problems, which undermine potential productivity and quality, therefore, the sooner we can begin to gain an accurate picture of what is happening, we can begin to change the methods and practices used to prepare for press changeover.



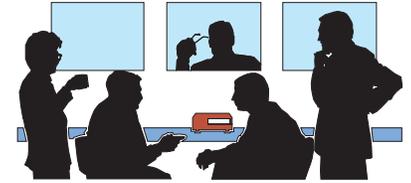
It should also be obvious that the press team has little or no control over the design and the specification of the tools, however, they have to deal with the performance of the tools on-press. Therefore, it is important to revise the Design, the Specification and the Fabrication of tools to make sure the parameters chosen are the most effective for efficient converting. Therefore, the third step of the four disciplines is:

3: In conjunction with the CAD-CAM, & Diemaking/Toolmaking Teams, develop/ upgrade the Specification, the Design and the Fabrication of the Converting Tools.

Through the implementation of these disciplines we can find out what is currently happening in press set-up, and begin to forge the best-of-the-best practices; through the implementation of a statistical Key Result Analysis, we can identify, quantify and attack specific technical problems



in tool preparation; and finally by starting the development of a Specification System for all of the tools used in diecutting, we can begin to develop more effective design and fabrication procedures, to eliminate the high percentage of changeover and production down time caused by ineffective tool performance.



Naturally, these actions do not happen in a vacuum, therefore, we need to consider the following steps as part of the Changeover Work Planning project:

- ➔ **Select and appoint a Team Leader for the project.**
- ➔ **Form a Work Planning Project Team, and include representatives of all of the departments impacting on-press performance.**
- ➔ **Invest in a Coach-Facilitator for the project.**
- ➔ **Get everyone together who are involved in diecutting, either directly or indirectly, define, discuss, brainstorm, and develop a consensus support for the project.**
- ➔ **Describe the three initial project steps, and select the team members who will be involved in the implementation.**
- ➔ **Schedule a series of information and discussion or meetings with the teams to keep everyone involved and up-to-date.**
- ➔ **Get started, time is of the essence!**



A further refinement is to start with one press, then convert the second and the third, in a gradual program of process improvement. These are all decisions to be made based upon the type of equipment, the nature of work, the operating structure, the caliber of the team and the team leaders in place.

This is not an easy task, even though each of the steps and the technical changes are relatively simple. We are asking people to change, to work together as a team, and to work for each other, for a more secure future.



Single Minute Exchange of Die: Project Management

“The conventional definition of management is getting work done through people, but real management is developing people through work.” Agha Hasan Abedi

It is unrealistic for an organization which is not built, is not practiced, and is not experienced in practicing aggressive daily process improvement, to embark upon a major process improvement program. Therefore, it is important to integrate key manufacturing principles such as Work Planning & Closing-the-Loop; it is important to involve the entire team and organization in an effective project planning system; it is important to recognize the integration of the Supplier-Customer Chain in manufacturing; and it is important to integrate a Coach or Facilitator as part or project organization and implementation.

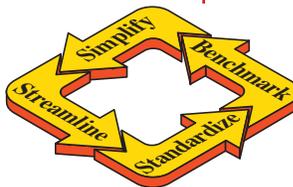
To ensure an effective project it is critical to integrate the following disciplines...

- ❖ **Key Manufacturing Principles**
- ❖ **SMED: Project Management**
- ❖ **Integrated Services**
- ❖ **The Coach-Facilitator**

... starting with

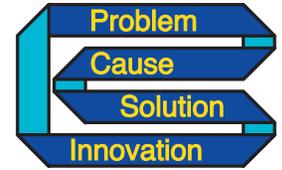
❖ **Key Manufacturing Principles**

This is not just another project, but it is an opportunity to restructure the way we work together, and to create a powerful and productive system of manufacturing. Effective communication is obviously essential; a focus on team building and teamwork is a necessity; and a willingness to share knowledge and experience fundamental to success; but these key ingredients must be integrated through a structured approach to manufacturing which continually reinforces better methods and practices.



1: Safety-Speed-Quality & Cost/Time

The highest priority in manufacturing is to work in such a way that the safety and the well being of every participant is protected at all times. The next step, surprising, is a focus on speed and not quality. Speed is the driving force of diecutting, anyone can run a press at slow speed, the goal is to maximize output, with the highest quality possible. After Speed & Quality, the drive is to become the lowest cost producer, which inevitably means the producer who produces the most, at optimal quality, in the shortest time possible.



2: Planning-Execution-Control & Evaluation

This is the learning cycle that is so important to progressive improvement. Plan what you are going to do, execute the procedure as specified, control the outcome as precisely as you can, but most important of all, close the loop and learn from the experience, so the next cycle and the next cycle and the next cycle can be steadily and consistently improved.

3: Standardize-Benchmark-Simplify-Streamline

It is essential to develop a standardized approach to manufacturing, which everyone is competent in and which they can execute consistently, every time. How do we measure the effectiveness of the procedure? We benchmark the procedure using time/cost, quality and consistency, as the measurement of success. However as soon as a benchmarked standard is established, we attack it relentlessly through every cycle to develop faster and simpler ways to do things.

Finally, we use the disciplines of Safety-Speed-Quality-Time/Cost and Planning-Execution-Control & Evaluation to streamline the system of manufacturing as we seek faster, easier, and better ways to do things.





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SMED: Project Management



This is not just another project, but it is a fundamental reorganization and realignment of the system of diecutting manufacturing. It is natural to be excited by the prospect of radical change and productive improvement, however, there are 7 guidelines it is important to consider. These are:

- **Be Realistic.** This initiative represents a major change in the way people work, and it will take time for the entire workforce to adapt and embrace each level or each step.
- **Assess your Resources.** It is vital to be practical and make a very hard assessment of the resources, and particularly the people, who will drive the project.
- **Choose your team leaders carefully.** Resist the politically correct choice and select key players based upon their proven ability to work positively and productively with people and to work in a team environment.
- **Develop a Cost Plan-Budget.** Given the scope of the project it is sensible to develop a detailed financial plan for the first phase only.
- **Set Conservative Goals.** It is better to over-achieve in the beginning than over-reach and fall behind.
- **Add 25% to all time estimates for each project step,** to accommodate changes in work mix, changes in people, changes in logistics and changes in technology.
- **Start Slowly.** Getting organized and getting started is the most complex phase of this project, so allow plenty of time, for the entire workforce to adjust and to get on-board.
- **Break the Project into Bite Size Pieces or Mini-Projects.** Start with a one month goal, then two months, and then three months, to give the teams time to gel and learn to work together.



→ **Communicate Relentlessly.** Get in touch, stay in touch, and keep everyone connected and engaged. Everyone who has to be involved

should be involved, even though it will take longer to get things done!



The preparatory work of building the Project Management System, selecting and organizing the Project Teams, choosing the best Team Leaders, and getting everyone focused and organized will be the most challenging part of the project. Once the project is moving, change, obstacles, and problems are inevitable, but if we have built a solid foundation, then the teams will work through bottlenecks and adapt as they go.

Starting slow, setting readily achievable goals, may seem a pedantic way to begin, but building teamwork and success, will get the project off to a great start and build everyone's confidence.

Integrated Services

This is not just another project, but it is a major change in the organization, the method of working and the output performance of a key link in the converting manufacturing chain.

Change in a diecutting operation does not happen in isolation, but everything is the result of the cooperation between CAD & Structural Design, External & Internal Diemaking, the Pre-Press Team, and the ever important Maintenance team.

In addition, diecutting is the result of, it is integrated with, and it impacts the performance of the entire manufacturing Supplier-Customer Chain. Therefore, making major changes to the current system of manufacturing, without the cooperative involvement of Graphic Design, Platemaking, & Printing, would be a serious mistake. Naturally, the post processes of Gluing & Finishing should be involved as should Estimating, Work Planning & Scheduling. Nor are we trying to create a bureaucratic monster, incapable of making decisions and moving quickly



The bottom line is representatives of all of these disciplines should play a consultative role to the project, and regularly partake in meetings, where their





performance is critical to success, or their performance is impacted by planned changes in diecutting.

*** The Coach-Facilitator**



This is not just another project, but it is an opportunity to solve the primary reason diecutting operations struggle with excessive operating cost, inconsistent yield, and

inadequate speed to market. Because they rely upon a group of individuals with significantly different levels of knowledge, skill and competence. In most operations individuals work using imprecise, non-scientific, inconsistently applied techniques and procedures, which have been proven time and again to be ineffective. Compounding this problem is there is no effective training program, no effective team building, and no effective plan of action to rapidly change the situation!

We are faced with intense and increasing pressure from an impatient marketplace, who seem to have an unlimited choice of cooperative suppliers. So what are the recommended actions we need to take?

- ➔ Give this project the highest priority and visibility in the organization, with full and demonstrable support from the top of the company, right through the management team.
- ➔ Hire a Coach-Facilitator to coordinate Teambuilding, Standardization, Training and Certified Behavior Development.
- ➔ Organize and build work teams around team-leaders, trainers, and in-house coaching/trainees.
- ➔ Standardize, and ultimately, videotape every key procedure involved in diecutting manufacturing.
- ➔ Implement the Training Map and the Skill Certification System, based upon demonstrated Behavior Development and Behavior Modification.
- ➔ Invest in this process ... allocate sufficient resources for practice, practice, and more practice.
- ➔ Don't back down, don't get cold feet, and stay the course.



The investment in a professional coach is the missing piece in our productivity puzzle. We have everything in place, we just need to focus the talent and the existing knowledge, skill, and experience in a cohesive and a cooperative manner.

Implementing Single Minute Exchange of Die
"I shall try to correct errors where shown to be errors, and I shall adopt new views as fast as they shall appear to be true views." Abraham Lincoln

Even when we break this project down into more manageable parts, we are still facing a complex and time consuming organizational challenging. Everyone would agree that if we are going to do this project, we should do it as well as we can. The real world dilemma is most organizations run lean, and most managers and supervisors have little enough time to complete their daily duties, and realistically have little discretionary time to invest in a project of this complexity.



To overcome this deadlock it is obviously essential to add more management resources to the project team. There are 4 ways to accomplish this:

- ➔ A Coach/Facilitator - We dedicated a part of the previous section to the benefits of this role and this type of proactive skill applied to almost every phase of process improvement. It may have seemed this was a luxury option, however, if we do not have a member of the management team with the time to drive the project, the appointment of a coach will certainly bridge many gaps. This does not mean the Coach is the Project Team Leader, but the person acts as an assistant to the Project Team Leader.
- ➔ A Retired Manager - Many companies have recently retired managers or supervisors, or they are located in an area where this type of individual has retired. Many of these individuals have both the skill and the desire to dedicate one or two days per week to a project of this type. As in the previous suggestion, I would not make them the Project Team Leader, however, they would be an invaluable resource



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for the person filling this role.

→ **Management Assistance** - Depending upon the size and the structure of your organization, it may be possible for a number of managers and/or supervisors to provide coverage for the Project Team Leader so this individual can commit one or two full days per week to the project.



→ **Consultative Assistance** - One option is to select an industry consultant to provide organizational assistance to the Project Team Leader. Naturally, this is an expensive option, and it would be necessary for the Consultant to be located close to the operation.

→ **Team Leader Development** - It is when we face our stiffest challenges that great people, often unexpectedly, emerge. This project contains many logistical details that do not necessarily have to be executed by the Project Team Leader. Therefore, a program to develop team leaders from the technicians and craftspeople already working in the departments involved, is a practical and often a very effective technique. Dividing each project or projects into smaller projects, each driven by a small team, led by a team leader, will develop these individuals, give them a great opportunity to grow and to succeed, and it would obviously provide excellent logistical assistance to the team leader.



As you can see, the innovation recommendations are all about project management and are not directly linked to technical change. However, if we do not lay a solid project management foundation for this initiative, and address the organizational challenges, prior to commencing this project, our efforts will be severely constrained.



We certainly need to get this project going, but the time invested in developing a

comprehensive system of project management will pay dividends in implementation, and smooth the way for rapid process improvement.



Staying on Course!

“Inspiration comes of working every day.” Charles Pierre Baudelaire

Our industry is renowned for unfinished projects, incomplete strategic planning, and unrealized and often unrealistic expectations. We announce a project with a mighty fanfare, we start at light speed, and soon, the project quietly dies, and is rarely mentioned again.

Most would agree that this type of process improvement project is too important to ignore, and the consequences of failure are dire. So why do we struggle to integrate fast and effective process improvement into daily manufacturing? There are a number of basic but important causes. These include:

→ **COMMITMENT** - Failing to gain the enthusiastic commitment of the Management Team, and particularly Upper Management and/or Ownership.

→ **COMMUNICATION** - Not communicating clearly with the entire organization, and failing to be realistic as to the impact of the project. Naturally, communication should be an ongoing process to explain progress and issues, and to keep everyone informed.

→ **SUPPORT** - Failing to gain the full and unequivocal support of the CAD-CAM, the Diemaking, the Pre-Press, and the Diecutting Teams. This requires dealing with those people who are malcontents or legends in their own minds, and who will surreptitiously and often blatantly sabotage the process. You know who they are and you must either deal with them up front or abandon the project! It is as simple as that!

→ **COSTS** - Failing to accurately estimate the cost of the project, and failing to prepare a budget, which is approved by the President or CEO. Asking the Financial Director, or the equivalent, to





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help with cost estimation and budget preparation is both practical, and politically astute!

→ TIME MANAGEMENT

- Failing to get the help you need to manage your current duties and to provide back-up when you are engaged in Project Management.

This could mean a temporary assistant, a part time secretary, a Coach or Facilitator, or support from other members of the Management Team. Production must go on, but you must be realistic in your assessment of the time required to make this project work.

Four goals of improvement:

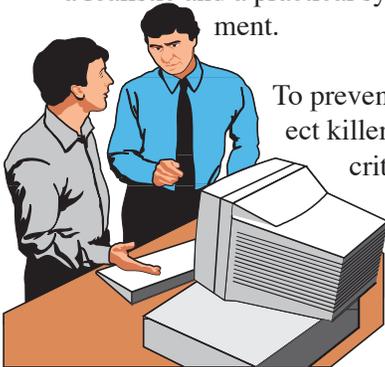
- 1) make things easier
- 2) better
- 3) faster
- 4) and cheaper.

To achieve this we must

- 1) focus on goals
- 2) recognize multiple goals
- 3) pursue goals systematically gradually toward the higher level of underlying goals.

Shigeo Shingo

Unfortunately, and regrettably, completing all of these preparatory activities does not guarantee success, but at the very least you will have laid the foundation for a realistic and a practical system of process improvement.



To prevent these traditional project killers from undermining this critical, and to ensure the best chance of success it is vital to attack and to minimize the impact of the following potential barriers.

→ TIME - We have to gouge out time from an overburdened schedule, to organize and manage this project, and even more complex, we have to find time and coordinate time for all the people involved in the project.

→ SCHEDULING - This requires coordinating the time, the activities, the resources, the people, and ongoing production, to set-up process improvement activities.

→ PLANNING - We must work with the team leaders and the team members, utilizing one or more meetings, to determine our plan of action



for the next stage of the project.

→ DEVELOPMENT - Having determined a plan of action and selected the changes or upgrades, or research and testing, to determine the most effective methods & practices, we have to determine the activities and steps required to accomplish the task.

→ PRACTICE - As we develop each new technique, change or upgrade to key procedures, it is necessary to test the new methods, and to make a team evaluation if the new practice is effective, or if it requires further development and testing.

→ CONSOLIDATION - After completing this development cycle, and having given all the key people involved time to participate, we need to consolidate the upgrade into a standard operating procedure, set preliminary benchmark standards, and create a Video Training Session.

→ TRAINING - Having identified a problem or an opportunity; brainstormed, revised and developed a new or an upgraded procedure; it is necessary to get everyone trained in the proper execution of the new technique.

When we have consolidated and stabilized the changed process, we repeat the cycle of *Scheduling, Planning, Development, Practice, Consolidation, and Training*.

If we follow these recommended operating procedures, and we invest in a comprehensive project pre-planning and preparation discipline, then our chances of long term success are higher.

Single Minute Exchange of Die: Summary

“The real voyage of discovery consists in not seeing new landscapes, but in having new eyes.” Mike Lancelot

It is unrealistic for an organization which is not built, is not practiced, and is not experienced in making aggressive daily process improvement, to embark upon a major process improvement program.

If you do have the experience and the resources to attack this project comprehensively, that is obviously the best





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way to begin, but for most organizations the recommendation is to proceed at a pace which reflects the ability of your management and diecutting teams. Start slowly and build confidence and competence step-by-step; utilize team work and team building; stop regularly to ensure everyone keeps up and consolidate changed methods and practices; and build upon each success to accelerate progressive change.

The obvious solution is to break the project down into more manageable pieces, and to organize and complete one project at a time. This can be further refined and more effectively controlled by implementing each project on one press at a time.



A smaller project is simpler to organize and causes less production disruption; process improvement activities, such as research, testing, and implementing new techniques are easier to schedule; the team is smaller, it can be hand picked, and will be far less challenging to work with; and the costs of process improvement and program execution are significantly lower.

This approach does require a delicate balance in the department, as it is important to include the entire team in the brainstorming and discussion, and the decision making process. If the entire team are not positively involved and comprehensively engaged, the eventual implementation of the new procedures or techniques on every press, on every shift, may turn into a struggle. It should also be obvious that we need to get everyone's ideas and suggestions so the upgraded process really is the best of the best.

By involving the entire team in many, if not all of the process improvement meetings, we demonstrate respect for their ideas and suggestions; we get the benefit of all of the knowledge and all of the experience of the entire team; and approval, training, and implementation of new methods and practices,

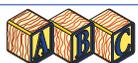


will be far less arduous.

Ultimately, you and your colleagues must make your assessment and develop a plan of action which reflects your needs and abilities. The most important recommendation is to be cautious, to be patient, to be realistic, and to be optimistic.

I like Joseph Conrad's comments, when he stated: *"To have his path made clear for him is the aspiration of every human being in our beclouded and tempestuous existence."*

Good luck!





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