56th Technical Conference & Expo

Profits Through Education

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Focus on the process,

not results-

If you improve the process, you will get results

Profits Through Education

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- Management's responsibility is to make the right decisions based on sound data from the shop floor.

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- Understanding the process and applying the correct controls to the process comes from proper education.

Profits Through Education

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This application of knowledge has increased profits for their companies.

Profits Through Education

I will also review what the ICI is doing to help train foundry personnel – whether owners, managers, supervisors or shop floor employees.

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Education comes in many shapes and sizes. I tried to come up a nice simple definition, but there isn't one- there are many.

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We all learn differently and we probably have examples of some very expensive ones. Those of us who have put our children through college know all too well the cost of higher education. But I can tell you from experience that my college education was cheap compared to what I have spent learning how to manage my business.

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Something I have learned from our customers is that some of the simplest changes to process control make the biggest impact on profitability for their company.

I will be sharing some of these examples with you today.

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I am focusing on wax rooms because that is my area of expertise, but all of these lessons can be applied to every area of the foundry.

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WHAT HAPPENED?

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- Foundry and MPI engineers worked together to achieve the goal of reducing cycle time using paste injection in a foundry that was previously all liquid wax.

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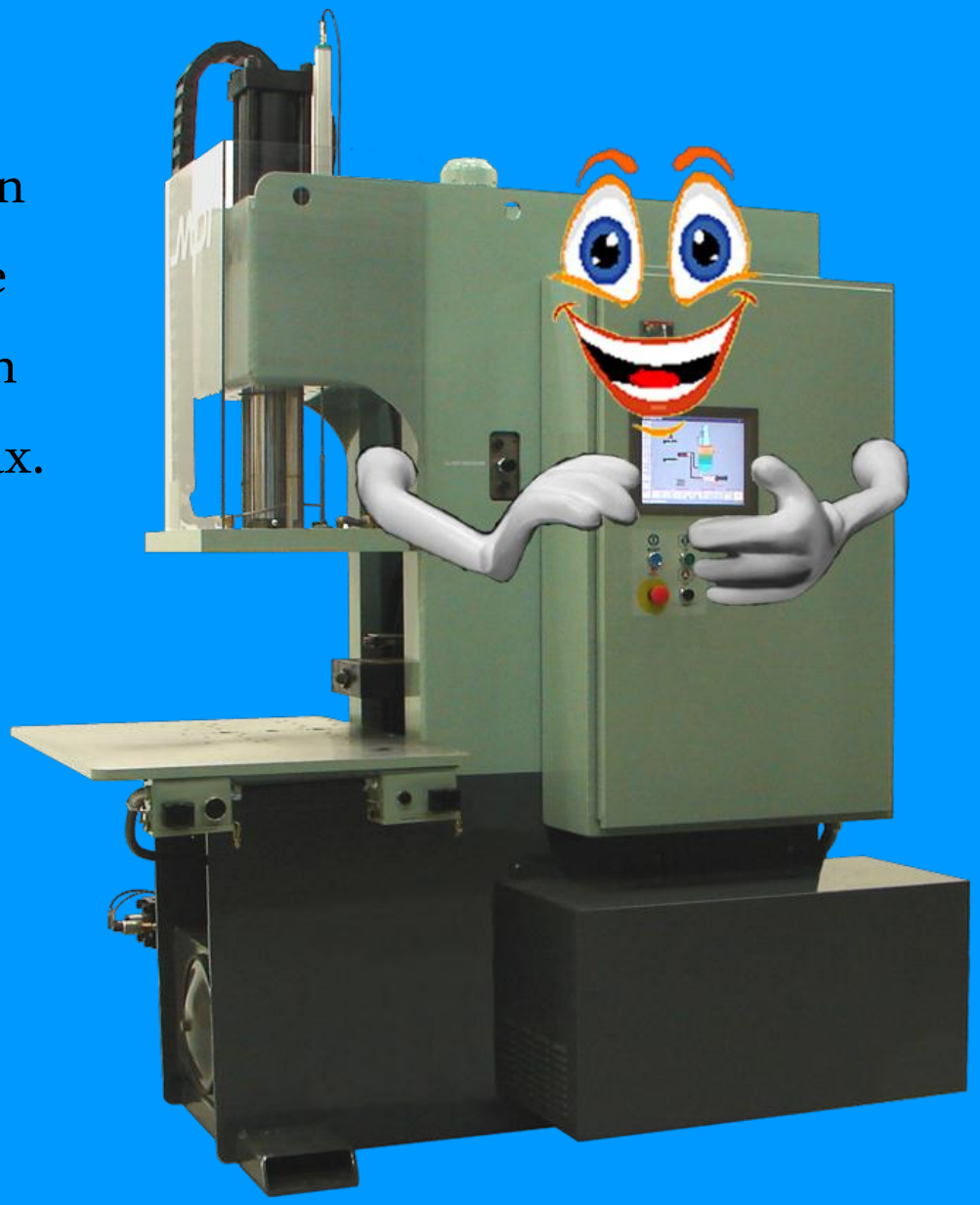
- Equipment was installed in the foundry, and tests at the site showed a 75% reduction in cycle time using paste wax.



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- The operators were properly trained on the machine's operation for paste injection.

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- The operators were properly trained on the machine's operation for paste injection.
- Customer achieved their production goals.

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One year later MPI visited the customer and the wax room was using the paste machine as a liquid machine.

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How did this happen?

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Possibilities could be…

- Management changed and the project goals were lost during the transition *–no means for transfer of information.*

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- First shift knew how to run the machine as paste and why, but the information never got transferred to second and third shifts -*no consistent training or documentation of training.*

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- Employees went back to what they were comfortable with- liquid wax –*employees did not understand the importance of improving cycle times or weren't trained on the use of the machines.*

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How many times have you wanted your staff to implement an idea and they just didn't do it.

Or, more frustrating, you thought that changes were implemented, but when you went back and checked, things were still going on the same as before.

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Unless you put into place a training program with documentation and a method of keeping the goals fresh in the eyes of the employees the program will not stick.

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Your employees need to be educated and they need to be part of the decision making process so that they understand the "why" for the change. This needs to be done to create long lasting changes.

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Now for some success stories

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- Pine Tree Casting has implemented lean procedures throughout their foundry. In the wax room, they went lean to reduce their WIP- Work in Progress. Previously the wax room consisted of two separate departments: the injection department and the assembly department. This approach created a large amount of inventory that also used a large amount of floor space.

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- Today, through a lean initiative, they use wax cells that consist of injection and assembly matched to the assembly person's throughput capability.

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- One of their cells consists of the following arrangement using 3 wax injectors.

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- One fully automatic wax injector running small, high volume parts managed by the pattern assembly person. The wax patterns fall into a pattern catch tank that is full of water and are presented to the assembly person at the end of the conveyor.

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- One semi-automatic wax injection machine operated by a second person making medium volume parts. The patterns are loaded into a tray and are transferred to the pattern assembly person.

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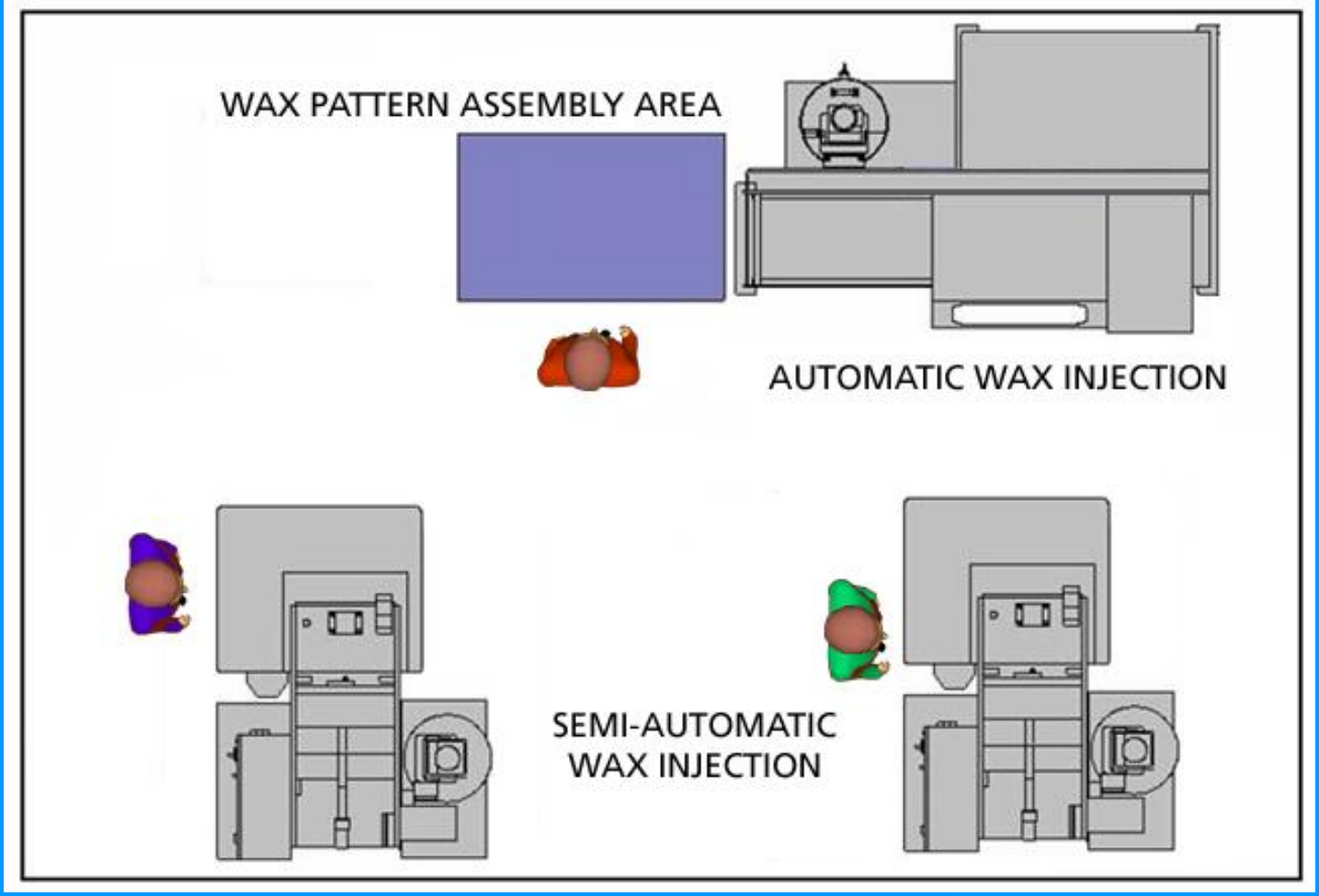
- A second semi-automatic machine run by a third person making low volume complicated parts which are also loaded into a tray and transferred to the assembly person.

Wax Cell


WAX PATTERN ASSEMBLY AREA
AUTOMATIC WAX INJECTION
SEMI-AUTOMATIC
WAX INJECTION

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This cell worked well.

The wax patterns falling into the pattern catch tank on the automatic machine were cooled by the water so the cycle times were short and the production rate was high. The patterns were assembled directly from the water bath and there was no WIP.

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The wax cell worked well until about mid day when the number of wax patterns started to build up at the end of the conveyor and production slowed down.

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What was causing this?

The pattern assembly person was not able to assemble the wax patterns because they were too hot for assembly and were requiring additional cooling time.

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But why?

They were falling into a water bath which was used to cool the patterns.

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The warm wax patterns were heating up the cooling water which increased the patterns cooling time.

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- The problem was solved by adding a refrigerated water cooling loop to the pattern catch tank.

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- By adding temperature control to the pattern catch tank and making the catch tank part of the wax room's process the work cell is able to meet the designed throughput.

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- This Wax Injection/Assembly Cell has reduced WIP by 80% over the previous method.

Profits Through Education

- This Wax Injection/Assembly Cell has reduced WIP by 80% over the previous method.
- Not only has the WIP been reduced, but the amount of time and effort transporting patterns has been reduced.

Pine Tree Casting

- This is an example of education through formal certifications – Lean Manufacturing.

Pine Tree Casting

- It is also an example of educated employees who were able to identify the problem because they understand the process control required in the wax room.

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Wisconsin Precision specializes in short run high value casting.

Profits Through Education

- Wisconsin Precision has attacked their business slow down head on, and they are doing if for the long term.

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- One of the many areas of improvement is the transfer of knowledge from one employee to another.

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- In the past, Wisconsin Precision would have their most experienced person in the department do the training.

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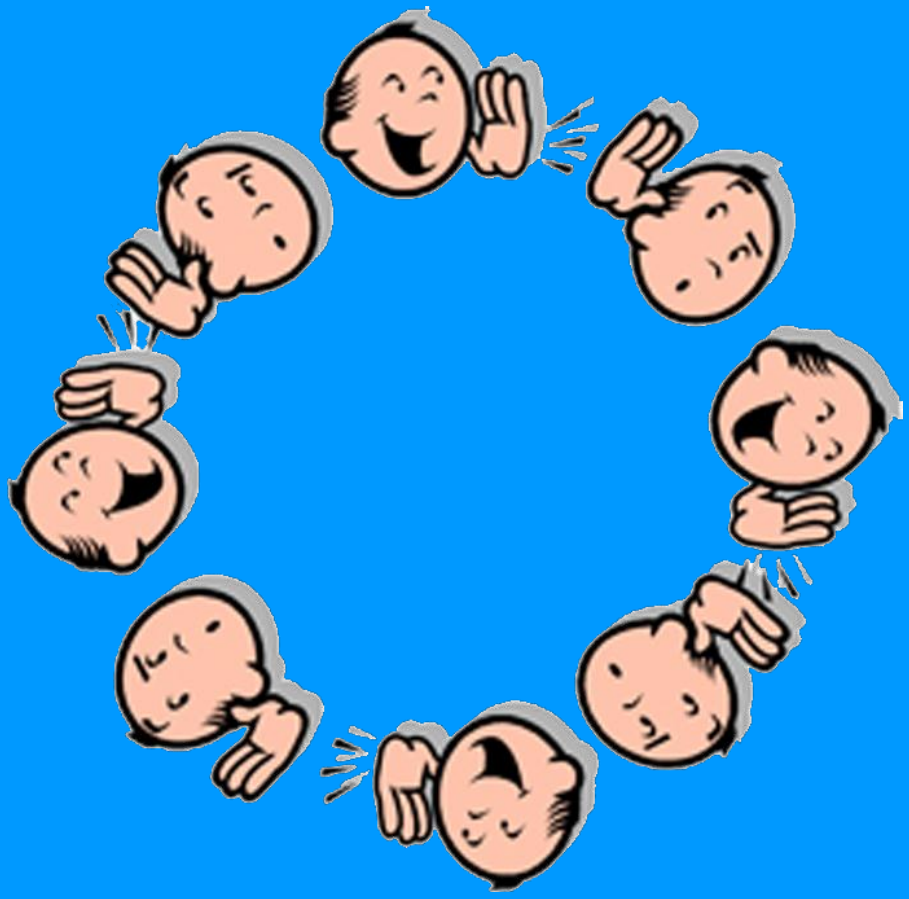
- Over time as new employees did the training things would get missed, very similar to the game of “Telephone”.



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Jose said 150°...

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Jose said 155°...

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Joe said 115°...

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Hey, who's Joe?

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MPI did formal wax room training at Wisconsin Precision and the training was video taped, edited, and is now part of their formal training program. They use this for all new wax room employees, again verifying that every employee gets the correct information.

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- Once the video is correct the training for each employee, on any shift, will be the same.

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- Once the video is correct the training for each employee, on any shift, will be the same.
- They are also creating tests so that they can verify that the employee has learned what is needed to perform their job correctly.

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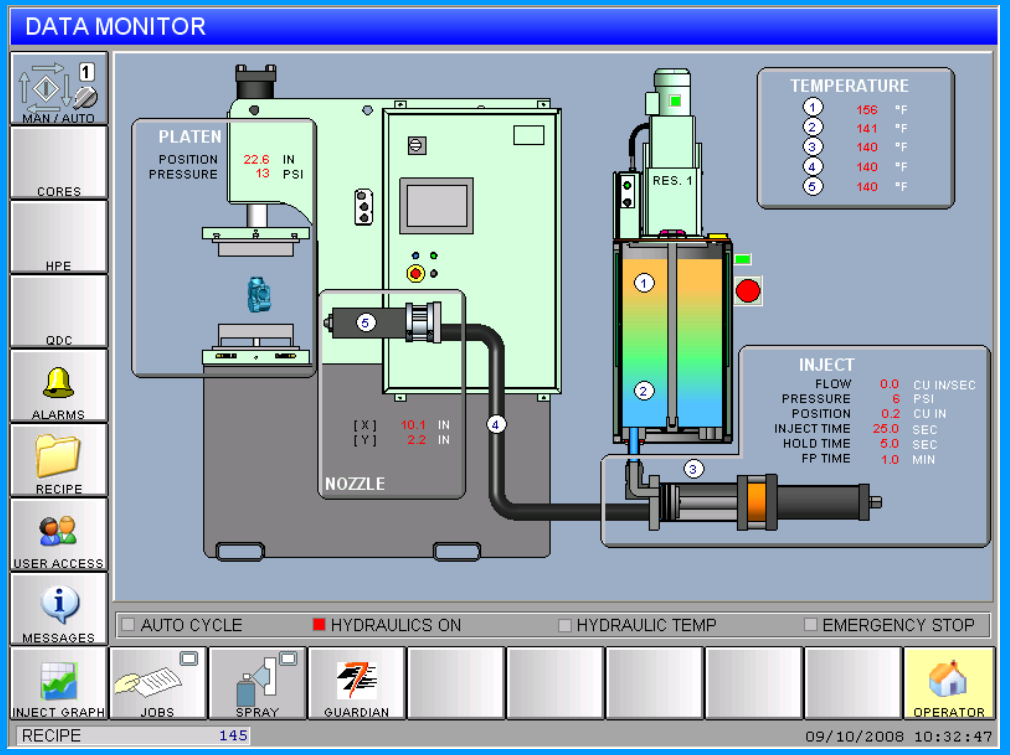
- In some cases the training video is reviewed at the machine every time the job is run.



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Reduced training time for an employee.

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Reduced the amount of errors created by the employee during the training program.

Improved productivity of the employee.

Wisconsin Precision

- The system for training the employee is now being controlled, which transfers into improvement of the entire production process.

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- The system for training the employee is now being controlled, which transfers into improvement of the entire production process.
- This is an example of education through formal training of employees.

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Johnson Matthey has had many years of experience using paste wax for pattern production. They realized that they would be able to get the same kind of productivity gains if they applied the paste injection technology to their runner production.

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With a limited budget, MPI worked with them to convert their old Jahnke C-frame injection machine from liquid to paste injection.

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- Machine conversion to paste wax improved sprue production 80%, the machines capacity nearly doubled.
- Improved pattern quality and stability of the runner.

Johnson Matthey Ltd.

Because the runner quality was improved the down stream foundry operations are improved resulting in reduced casting scrap.

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Johnson Matthey Ltd.

	Liquid Injection	Paste Injection
Sprues per hour on average	10	18
Sprue requirement per day	100	100
Sprue Production per 240 day year	24,000	24,000
Annual production hours	2,400	1,333
Sprue Cost per year	$134,400	$74,667
Annual Savings		**$59,733**
Annual Simple Payback		0.87
In Months		10

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FUPRESA

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Fupresa is a commercial investment casting company located in Brazil. They specialize in supplying high quality precision castings to key producers in the automotive industry. Some of the products include rocker arms and shifting forks.

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MPI was commissioned by Fupresa to do an evaluation of their wax room along with some personnel training. MPI observed that the wax room was making very high tolerance patterns using the following procedure.

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- All of the wax injection machines were injecting a liquid wax.

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- The wax reservoirs on the machines were being filled manually.

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- All of the wax injection machines were injecting a liquid wax.
- The wax reservoirs on the machines were being filled manually.
- Some of the machines had a wax temperature variation during injection.

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- Each pattern was removed from the die and placed onto a setter. A setter is a device that is used to prevent the wax pattern from distorting during the cooling of the pattern. The setters insure that the required pattern tolerances are met. The results achieved were very accurate pattern to pattern tolerances.

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MPI spent time training their personnel on the importance of wax temperature control and how a temperature variation in the machine can affect pattern to pattern quality and repeatability.

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Time was spent showing the advantages of paste wax injection for reducing cycle times as well as improving the wax pattern's stability by reducing the internal stresses caused by high temperature injection.

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Today Fupresa is injecting these patterns using paste wax temperatures with new injection machines. The machines have wax melters with automatic wax level controls which maintain a full wax reservoir. The results of these changes are as follows:

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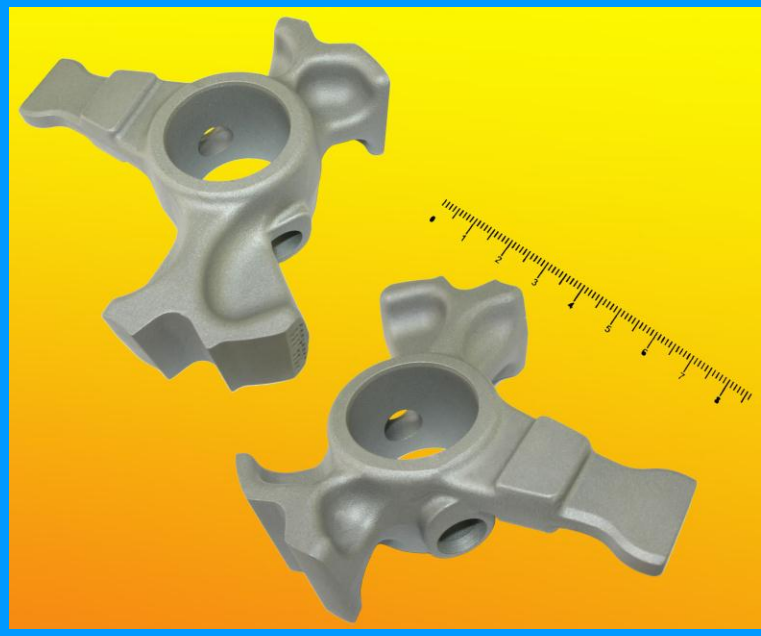
- They have a very uniform wax temperature from injection to injection which has reduced the pattern to pattern variability right from the machine.



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- Colder wax temperatures have reduced their cycle times by an average of 40%

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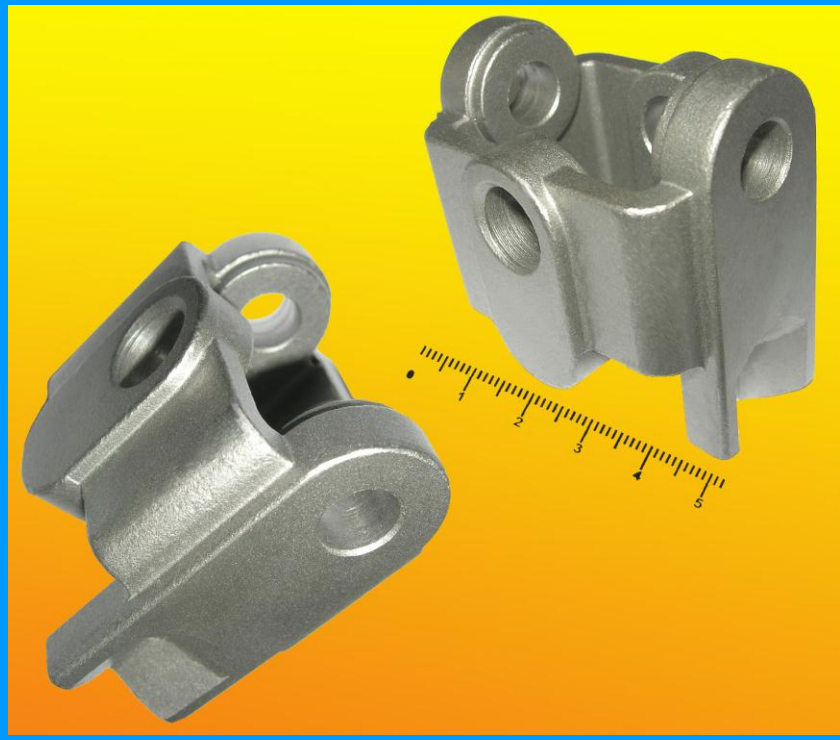
- In addition to the cycle time reduction they have the following selling advantages



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- Pattern to pattern repeatability has improved allowing for the use of fewer setters.

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- The cost of manufacturing setters has been reduced.

Profits Through Education

- Fupresa states that their wax injected in a paste condition is helping them make auto parts with tolerances tighter than "D3" requirements.

Fupresa

- This is an example of education through working with vendors.

Fupresa

- This is an example of education through working with vendors.
- Fupresa has done a very nice job of implementing what they have learned and they are now more productive because of it.

ICI Training Courses

- The ICI has been running the Investment Casting Institute's annual Certification Course at Pittsburg State University for 9 years. This course covers subjects from casting design and development right through every step of of the investment casting process –from wax room to casting finishing.

ICI Training Courses

- This comprehensive course enables attendees to see how their job fits into the whole picture. For instance, a wax room employee can see why a poor wax pattern results in increased waste throughout the process while an employee in dipping can see some of the difficulties in creating a quality wax pattern.

ICI Training Courses

- This year will be our 10th Anniversary- and the class gets better each year.

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- Congratulations to the ICI on a very professional course that improves our whole industry.

ICI Training Courses

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- In 2010 the ICI will introduce our second ICI course "Investment Casting Process Control"
- This course will cover the entire foundry process which will be broken down into four basic areas:

ICI Training Courses

People

ICI Training Courses

People

Wax

ICI Training Courses

People

Wax

Shell

ICI Training Courses

People

Wax

Shell

Foundry

ICI Training Courses

- The key process control variables of each section will be highlighted and we will teach how these variables affect the process and what can be done to control them.

ICI Training Courses

- The ICI looks forward to working with you teaching you and your people the basics of Process Control with practical take home examples. You will be able to implement positive process changes to your foundry resulting in more control in your process and gains to your bottom line.

Summary

- I think it is clear that there will always be room for improvement in every aspect of the foundry. The way improvements are made will vary from foundry to foundry. A common thread throughout all foundries - in fact throughout all businesses - is education.

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- Education never stops, how we educate people will continue to improve.

Thank You