GREDE

Grede Foundries, Inc.
Vassar, Michigan

REALTIME

Case Study

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Introduction

Grede Vassar is a high production shop, specializing in small iron castings. Their facility can produce 112 tons of castings per day. They utilize the shell sand technology for their casting production.

General Foundry Information

Product Line:	Small iron castings ranging in weights from .5lbs to 18 lbs. For example: car rear drum brake cylinders, brake master cylinders, and pump housings to name a few.
Casting Metal Type:	• Gray Iron
Melting Facilities:	• Cupola
Sand Facilities:	• Shell Sand Processes (They coat their own sand) • Sand Usage – 1900 to 2000 tons/month • Resin Usage – 130,000 to 140,000 lbs./month
Cleaning Facilities:	• Tumbleblast
Heat Treating:	• Normalize Furnaces
Pattern Shop:	• Repair Metal Patters
Other:	• Machining Facilities

Project Objective

The objective and need of the foundry was to get better control over their shell sand coating operation. The process was highly labor intensive and had minimal process control. The sand coating operation provides the foundry with 100% of their sand. They also sell some shell coated sand to other foundries. Along with getting control over the coating operation, they also wanted to increase the flexibility and product repeatability. For information the original system was installed in the mid 1960's.

Original Problems

- Continuous maintenance problems with existing system that only a few maintenance personnel could troubleshoot
- Inaccurate and Inconsistent chemical additions
- Limited to only a few recipes
- Had only 2 or 3 individuals who could run the old system
- Needed documentation from area to help obtain customer certification

Solution

They installed the MT Systems REALTIME Computerized Resin Control System during February 1989. The basis of the system was to give them the flexibility to produce any type of coated sand by selecting the desired recipe (No manual adjustments). The system was to accomplish this by using modern process control techniques and then fully document the batch data.

To accomplish the above goals, the mullor was outfitted with the following hardware:

- The sand and resin hoppers were placed on load cells.
- A completed hexamine addition system was designed and added.
- All gates had solid state limit switches installed.
- New heating drum controls were installed.
- Computer controls replaced all existing electrical controls.
- Temperature elements were installed at strategic points.
- Amperage transducer was installed on the mullor.

Their production works as follows:

The operator initiates the days production by turning the heating drum controls on, entering which recipe he needs to produce, then turning the control over to automatic mode. Once in automatic mode, the computer will produce continuous batches until the recipe is changed, the system is switched to manual mode, or a problem occurs. All batches are mixed from a recipe. A recipe is a set of instructions that includes steps and ingredients used in the making of a batch of sand.

First the system weighs up the sand to its setpoint. The system then takes the actual sand weight and calculated the other ingredients setpoints. Next, the sand is discharged into the heating drum. While the sand is in the heating drum the other ingredients are being weighed up, the sand is discharged into the mullor.

Solution

At precisely the right time the other ingredients are charged in the prescribed manner outlined by the recipe. After the mix cycle is complete the coated sand is discharged to the delivery system.

The system provides complete documentation for managements review. The system produces daily operations log and a consumption report. The daily operations log documents what went into each batch of sand. This consists of the recipe; mix time, batch finish time, sand weight, ingredient weights, sand temperature and ambient conditions. The consumption report documents total sand and ingredients consumed, total mixer run time, total bat h produced. This data is categorized by shift, and then broken down into a daily, month-to-date, and year-to-date format. All data is permanently stored for future recall.

It is also important to note that if the process variables deviate from setpoint the system does alarm and shuts the operation down. The computer also provides diagnostics that indicates which variable or discrete input is shutting the process down.

Results and Benefits

- Reduced resin levels by 9.7%
- Reduced maintenance downtime and maintenance expenditures
- Increased batch size by 4.3% (1150 to 1200 lbs)
- Increased productivity by 17.6% (Average shift production was 85 batches, now it's 100 batches)
- System runs itself when in auto mode - They have quality consistent sand no matter who the operator is
- Their Hot Tensile Test before the system had a MEAN of 245, a Standard deviation is 23.19, and CPK of .65. After the system the MEAN is 252, the Standard deviation is 9.38, and the CPK is 1.71

Monetary Savings/Pay Back

	Monthly	Accumulated
• Reduced average resin usage from 3.78% to 3.41%	$8,044	$313,716
• Eliminated maintenance expenditures on old system	N/A	N/A
• Reduced area downtime	N/A	N/A
• Scrap sand reduction	N/A	N/A
• Casting scrap reduction	N/A	N/A
• Increased area productivity	N/A	N/A

Other

The project engineer responsible for the project feels very strongly about the system and how it has streamlined their operation. He knows that they are producing the highest quality sand they've ever produced. He is committed to this type of process control and wants to implement it in other areas of the plant.

The operators are also very pleased with the system. They played an integral parting the design of the system, because they were the only ones who could make the old system work and they thoroughly understood the process.