

Utilizing IIoT Technology to Identify Process & Energy Improvements in the Foundry

Full Scale Implementation OR Pilot Scale/Study

1. Description of the project: What is the issue and how did you fix it?

I have some first-hand experience with a major project that AFS sponsored in the Meters and Metrics area. The following is a summary of what we did... As the old adage says, "You Can't Manage What You Don't Measure". Well, IOT (Internet of Things) and AI (Artificial Intelligence) technologies now offer amazing new capabilities to measure, manage and take action. AFS began exploring these capabilities by funding AFS Research Project 12-13#03 (Identifying, Implementing and Sustaining Energy Savings). A number of AFS member foundries participated.

IOT data collection was accomplished with a complete solution provided by Sensor Synergy of Vernon Hills, IL. Various non-intrusive sensors were installed on equipment of interest (melting furnaces, air compressors, motors, etc), data was collected and uploaded every minute by a secure link (Wifi or ethernet) to cloud servers. We found this end-to-end data collection to be inexpensive and easy to install. Be aware that many IOT implementations require your IT department to purchase, integrate and test multiple application components, which can be very expensive. The Sensor Synergy system collected sensor data every 2 seconds and time-stamped it via a common clock, which is vital to making sense of the data. Correlating data from multiple sensors was essential to answering questions such as "What is the effect on vacuum header pressure in the plant when we shut down a vacuum pump motor?". Data analysis evolved from basic reporting of individual sensor data to more comprehensive business reporting. The Microsoft Power BI (Business Intelligence) platform was used by TDI Energy Solutions of Lemont, IL to develop a reporting dashboard for metalcasters. Examples include relative productivity of furnaces, melting energy efficiency (pounds melted per kWh), electricity cost per furnace (melting vs not-melting), etc. Ability to filter / compare metrics by date, shift, furnace, etc were included. Some components of AI were incorporated.

Green Foundry Project

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Many lessons were learned during this R&D project. While the initial goal was to discover opportunities to save energy costs (and there were many), we discovered even larger savings from potential process improvements. The virtually continuous data collection offered a new perspective to overall operations. As Director of the AFS Energy Solutions Program, I was asked by AFS to oversee this project. Our efforts were closely monitored by AFS technical staff. TDI Energy Solutions and Sensor Synergy collaborated to make this project a big success.

2. Environmental Benefits: Conservation of raw materials or energy, reduction or elimination of emissions, wastes, toxics, water discharges, etc.

Energy conservation, process improvements. Analysis was focused in areas of energy consumption, with savings opportunities identified in electric, gas and compressed air. Environmental emissions would probably be lowered, but were not measured.

3. Other Benefits: Productivity, health and safety, employee morale, etc.

Dramatic productivity improvements identified.

4. Cost Savings: Capital cost, operating cost, ROI or other pertinent cost information.

Significant cost benefits identified at each foundry that participated in the R&D study. Please see final report for details, but some savings opportunities exceeded a million dollars per year.

5. Applicability to other foundries and additional Comments

Applicable to virtually any metalcasting or other large energy consuming facility.

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6. Applicable Environmental Categories and Foundry Processes. Select all that apply.

Environmental Categories

- Carbon (GHG) Emissions Measurement and Reduction
- Air Quality Water Use and Discharge Waste Management
- Beneficial Use Stormwater Material and Resource Conservation
- Community Engagement

Foundry Process(es) Impacted

- Melt Pour Mold Core sand system/reclaim
- Shakeout Heat Treat Quench Finishing Shipping
- Maintenance Pattern Shop Casting Design
- Management Systems and Metrics
- Other, explain:

7. Add photos to enhance your application, if applicable.

