

# PROCESS OPTIMIZATION WITH ADVANCED CONTROL TECHNIQUES



**JERRY SENK**

President  
EQUIPMENT MANUFACTURERS INTERNATIONAL, Inc.



## ARTICLE TAKEAWAYS:

1. Understand your vendors' standard and optional supply for advanced control features
2. Nominal increase in capital cost will be quickly realized in lowering on-going cost of ownership and improved profitability
3. Next generation 'predictive analytics' maximize profitability, satisfaction, and safety

Foundry managers are constantly challenged to do more with less; do it faster and cheaper, and improve quality - all the while doing it safely. Oh, and these requests are normally accompanied with fewer staff and decreasing budgets. This article will explore how implementing advanced control techniques can help foundry managers meet their process optimization goals.

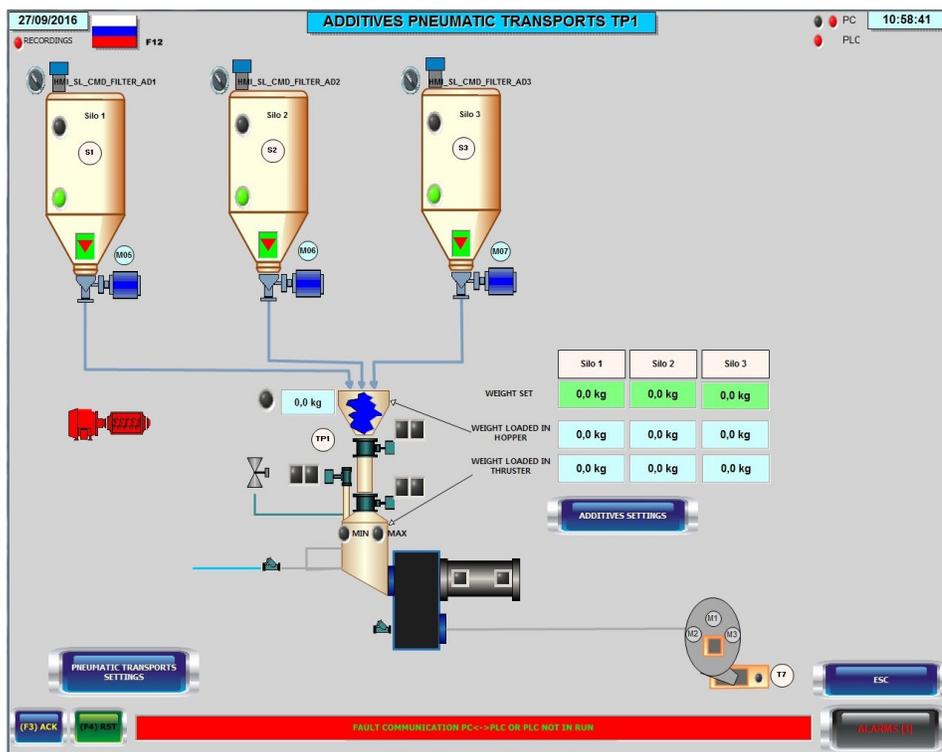
Using advanced control techniques has been proven to be an effective tool in optimizing operations, reliability, and quality. Even newer techniques that integrate predictive analytics can

provide higher uptime reliability and reduce operating costs. When foundry equipment breaks, the result is clear; production comes to a grinding halt and the personnel necessary to resolve the issue might not be readily on hand. As a result, companies are faced with unplanned downtime until the problem is resolved, potential overtime wages for the necessary personnel, along with the increased costs of rushing critical part shipments and more.

When considering any new production equipment, automation and control techniques should be thoroughly examined. The foundry

operations team should identify goals and work with your equipment manufacturer to implement effective control techniques that work to meet and measure your goals. Implementing a well thought out automation and control platform early in design will help the foundry meet the obvious optimization goals with nominal additional cost. Consideration to adding advanced control features to existing equipment should be looked at closely too, but realize this may come with higher costs and downtime that may not meet certain goals.

The process control in modern foundry equipment is most commonly provided in programmable logic controller (PLC's). Furthermore, the maintenance departments in many foundries have electrical specialist's that are fully trained in programming and operating PLC's. In most cases, standardized control packages are included by the OEM that offers simple interface with the machine. The programmed logic normally operates the machine without any input from the operator. This provides a high



degree of safety, reliability, and repeatability.

Often overlooked by the buyer, are available or optional advanced control features that can help to improve production output, quality, and uptime reliability. Consider a modern mold line and handling system; there are hundreds of points input and output registers that are used to control, position, measure, and interlock electrical, pneumatic, and/or hydraulic devices across the system. The use of a PLC is the most economical means to control such a complicated device. A brief list of example advanced control features could include:

#### First fault annunciation –

identification of the component causing a fault or alarm. This

feature will direct the operator to the exact device requiring troubleshooting and corrective attention. Having a clear understanding of what shuts your system down is always the first step at troubleshooting and works to speed the correction. First fault annunciation is a very common standard feature supplied by many suppliers that have in-house electrical engineering departments.

#### Interpretative annunciation

– while first fault is a basic identification feature, identifying the root cause of that components fault may involve several potential culprit causes. In many cases, component failure can be a physical misalignment, electrical failure, heat or pressure failures, and many more. In

these cases, following a set of prescribed troubleshooting steps may be required. This may involve referencing the supplied operations and maintenance (O&M) manuals, referencing the component manufactures documentation, or even contacting the OEM for telephone support. In each case, several steps may be required to affect a process of elimination identification of the root cause. Interpretative annunciation utilizes additional data surrounding the system to help pin-point the reason behind the component failure and helps the maintenance team speed up the time to re-start.

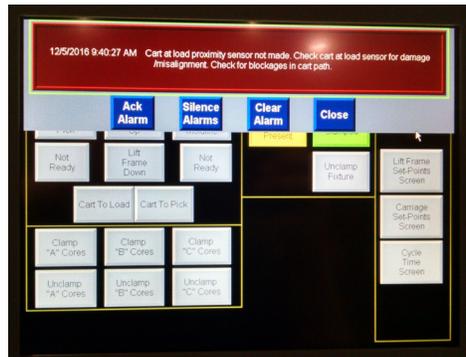
#### Troubleshooting help features

– Using a well-designed Human Machine Interface (HMI) will provide quick identification and suggested resolution techniques for any component alarm. A well-engineered HMI will provide the first fault and interpretative annunciation along with a listing of steps the operator should follow to quickly correct the situation. This is effectively preprogramming the HMI with written troubleshooting steps specific for component failure  
**continued ))**

Contact:  
**JERRY SENK**  
J\_senk@emi-inc.com

actions. The maintenance technician can immediately be told what component has alarmed, a suggested point of inspection, and suggested steps to resolve the failure; all without having to find the O&M manuals, page through the O&M manual for referenced help, or even having to call for help. Additional help features that employ a connected modem will allow the OEM Service Department to access your system and help to quickly correct the problem.

All these features described above require additional components, programming, assembly, integration, and will add to the total installed cost of your system. But when you consider the ongoing cost of ownership and returns on reliability; these costs can be insignificant. The results of a recent mold line installation showed the potential value to the foundry. In this case, the revenue potential is over \$10,000 per hour. Therefore, speed to re-start is vital. By integrating the features mentioned above, simple alarms were quickly and effectively resolved with very little disruption to the mold line process. When compared to similar molding systems with less sophisticated controls, the additional costs offered a comparable return on investment of less than 3 months.



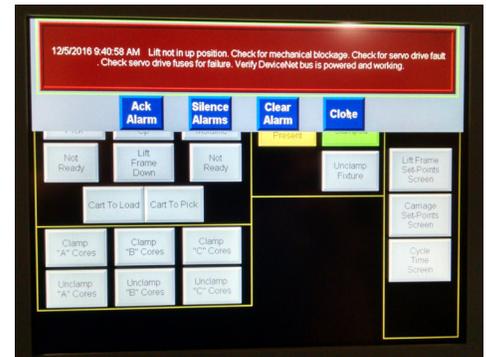
The advanced control features discussed may all be offered “a-la-carte” or as complete optional packages. If you are considering or specifying new equipment, be sure to ask your potential vendors about these options.

But what’s the “next-generation” in advanced control? Innovative and forward thinking companies should be looking at what we call Predictive Analytics.

What if your foundry machines could tell you:

- It isn’t operating correctly?
- When a cylinder or actuator rebuild is going to be necessary?
- The best time to conduct a maintenance event?
- Real time changes in product quality?

Predictive Analytics combines additional non-traditional component sensing and smart “maintenance-minded” thinking that helps predict when failures can occur and provides advanced warning of the potential outage or changes



in production. Predicting when maintenance is needed and preventing failures or rejects before they occur carries several additional benefits, including avoiding high-cost events, increasing foundry uptime and reliability, reducing the need for frequent maintenance/repair and minimizing the maintenance burden placed on shop personnel by unexpected downtime, and reduced scrap.

The future of Predictive Analytics will provide a smart, connected foundry with the capability of monitoring in-service equipment to capture and respond to real-time operational data. The data capture will assist foundry operations with quality and ISO reporting, identify maintenance trends, deteriorating conditions and more. This, in turn, helps foundry managers plan ahead – whether that means scheduling the necessary personnel to perform maintenance or ensuring the necessary replacement parts are in stock.

Contact:  
**JERRY SENK**  
J\_senk@emi-inc.com