

# Automation With Human-centered Design Delivers Results at Samarco

By Paulo Correa

All organizations need to protect their assets, but doing so is particularly difficult for industries with equipment installed in harsh environments. At Samarco's iron ore pelletization plants, thousands of tons of iron ore are processed daily through rollers, mixers, belts and other moving machinery, leading to huge furnaces that run at temperatures up to 1,350°C. Samarco needed to find a solution to monitor equipment that could be flexible enough to allow changes in operational procedures yet robust enough to detect even minor changes in equipment functionality.

When the company began to develop its fourth pelletization plant in 2014, the primary goal was to incorporate an automation system that would improve safety, reduce downtime and offer flexibility in equipment configuration. It found a solution in Emerson's

DeltaV distributed control system and AMS Suite asset management software, coupled with a human-centered design (HCD) approach to the system's implementation.

Implementing an asset management system in the construction of Plant 4 meant creating a safer and more efficient maintenance environment at Samarco. Before, electricians configuring engine protection relays needed to go to the electric room and open the device drawer to make a local connection between a handheld field instrument analyzer and the relay. This exposed technicians to the risk of shock or electrocution while making a change. Now, they can configure engine protection relays from the control room, changing any necessary parameters without time-consuming walks, and exposure to the risk of accidents in the electric room.

Another major advantage of improved asset management is the ability for operations and maintenance personnel to prioritize process information and alerts. After analyzing the criticality of instruments and the processes they measure, the maintenance team adjusted prioritization settings in AMS Suite to fine-tune how and when the system would deliver alerts. They can give attention to the most critical instruments in the most critical processes, allowing them to direct valuable maintenance work hours to the projects that are truly important.

Predictive diagnostics in the asset management system speed up classification of a problem, allowing the maintenance team to spend less time analyzing and more time repairing. All of this detail is presented in an easy-to-understand, comprehensive format through the HCD principles Samarco implemented during system design.

Before implementation of the automation system even began, Samarco decided that HCD best practices would need to be incorporated into the philosophy of the displays on operator screens. On every screen, critical information is highlighted in a way that makes it easy to identify and understand.

In the past, the company used screens that had many different colors, and fancy 3-D renderings that offered little actionable data. All of these elements on the screens required a great deal of the operator's attention, occasionally causing operators to miss important issues because they were focused on the wrong data.

With the Plant 4 project, an emphasis was put on the way the company works with the control screens. Today, it has soft-color, highly organized screens that help operators stay relaxed and focused on critical data. When equipment cannot operate properly, it sends an alarm that can be detected immediately. This has had a massive impact on productivity and safety.



Samarco's pelletization process requires mission-critical equipment to perform consistently in a harsh environment.

## About Samarco

Established in 1977, Samarco is a privately held Brazilian mining company that is jointly controlled by two shareholders: Vale S.A. and BHP Billiton. Its main product is iron-ore pellets, which it exports to customers in 20 countries in the Americas, Asia, Africa, Europe and the Middle East. Following startup of its fourth pellet plant in the first half of 2014, production capacity has risen to 30.5 million metric tons per year (mt/y).

For example, when operations personnel report a problem in a field flowmeter, a control room technician can examine the problem in the asset management software. After identifying the process variable, if the technician does not find the problem, he runs a diagnostic on the flowmeter. If the diagnostic returns an alarm signaling noise in the process and reverse flow, the technician can transmit that detailed diagnostic data to maintenance personnel. The maintenance team can then go to the equipment knowing exactly what to check. They can perform initial equipment diagnostics quickly, without ever leaving the control room.

In addition to improving safety and maintenance at the plant, AMS Suite coupled with HCD best practices has allowed Samarco to improve its training. Very little time was needed with the training team when it transferred from project tests to routine production because the system was so simple and intuitive. It also does not have to spend a great deal of time teaching new staff how to use the monitoring system, and can have new employees working efficiently in very little time.

With the implementation of the new systems, Samarco has minimized potential fire and explosion hazards from the plant furnaces in observance of National Fire Protection Association (NFPA) 86 regulations. With the distributed control system, it was possible to include all of the necessary logic inside the safety system to allow 100% compliance with NFPA 86.

Through predictive diagnostics, maintenance personnel are able to follow degradation of field devices over time by running regular equipment reports. This allows them to focus on predictive and proactive maintenance rather than emergency repairs, minimizing unexpected equipment outages and process interruptions. In addition, because the maintenance team has greater control



Samarco implements soft-color, highly organized screens to help operators focus on critical data.

over when and how it performs repairs, it reduces the number of technician trips to the field, thus reducing the technicians' time in the area of the equipment, increasing overall safety.

Beyond safety and efficiency concerns, the company has improved the quality of its product. With more precise management of furnace temperatures, pellet quality is more consistent. The technicians can carefully control the temperature in the cooling region of the plant, one of the most critical variables in production, resulting in a final product of the highest quality.

Samarco intends to expand the implementation of Emerson's technology to other plants in the complex. The use of HCD in operator displays has already been implemented at Plant 3, and the company is considering plans to add it to Plants 1 and 2.

---

*Paulo Correa, an electrical engineer at Samarco since 1989, is responsible for implementation of the company's automation projects.*