

IMPROVED RELIABILITY AND QUALITY HELP RANK DOFASCO AS NORTH AMERICA'S MOST PROFITABLE STEEL MAKER

Dofasco is Canada's 2nd largest steel manufacturer producing 4.5 million tons of flat rolled steel per year. With revenues of over \$3 billion per year, Dofasco is North America's most profitable steelmaker. Known for its technological and business innovation, Dofasco produces a wide range of products lines that include hot rolled, cold rolled, galvanized, Galvalume(TM) and tinplate flat rolled steels, as well as tubular products and laser welded blanks. Dofasco's products are sold to customers in the automotive, construction, energy, manufacturing, pipe and tube, appliance, packaging and steel distribution industries.

The Situation

In the late 1980's, Dofasco recognized that their existing business model would not be sustainable through an increasingly global marketplace. With a worldwide steel overcapacity, comfortable profit margins no longer seemed viable for North American steel suppliers. Competition from low-cost Asian exporters drove down the price of steel while inflation raised costs. Customer loyalty was also being tested with orders going to suppliers who could provide just-in-time deliveries and consistent high-quality product.

The Challenge

To combat these competitive pressures, Dofasco needed to reduce costs across all operations and improve product quality.

With an asset base valued at over \$5 billion, it's no surprise that maintenance was one of the areas that was scrutinized. Dofasco undertook an evaluation of their maintenance operations and found that they were operating in an environment where 70% of their work was reactive and only 30% was proactive. Maintenance efforts weren't properly coordinated or prioritized. Instead of proactively managing their most important assets, they simply fixed whatever broke. As a direct result, the rate of product quality improvement was flat and their average equipment availability was only 78%. In addition, islands of maintenance data were scattered throughout the organization in OEM manuals, in computer databases and in filing cabinets. None of the information was easily accessible to personnel planning the maintenance work and resulted in inconsistent actions. With an aging workforce, risk of losing significant expertise was also an issue as employees retired.

Dofasco recognized the need to improve their maintenance practices and responded by introducing a reliability based maintenance methodology with the

objective of improving product quality, production output, costs and shareholder return.

The Solution

Dofasco initiated a strategic project to research, develop, and implement the most advanced maintenance practices and information technologies to achieve maximum equipment reliability. They applied reliability best practices, reliability centered maintenance and developed an enabling technology (the predecessor to Ivara EXP) to their operations with dramatic results.

In order to implement their strategic project, Dofasco introduced their Reliability Driven Maintenance Process. Its objective was to identify the information that was necessary to be managed and the practices and activities that were needed to be implemented. The process had four phases:

1) Plan. The planning process was designed to ensure that everyone understood their business unit goals and how their assets would contribute to these goals. By understanding this, they could now target their equipment reliability efforts on the assets that contributed most to the business unit goals. They identified their most critical equipment - the equipment they could not afford to have fail. Then they analyzed how, when and why the equipment failed.

2) Improve. This phase was designed to ensure that the proper maintenance program was identified for each asset. Work identification was key to equipment reliability. The maintenance plan for an asset may have included a mix of preventive maintenance, predictive maintenance and run-to-failure decisions.

3) Control. The control phase involved doing the actual work and managing the business process

associated with work execution. Dofasco was currently using a Computerized Maintenance Management System (CMMS), to efficiently plan, schedule and execute work.

4) Assess. This phase provided an opportunity to continuously improve. All variables that affected the reliability of critical assets were measured and monitored. Performance of the asset was compared to targets and any gaps remaining were analyzed and the asset maintenance program revisited.

In order to support these processes, Dofasco implemented a number of practices and procedures. They included reliability centered maintenance (RCM), predictive maintenance needs assessment, criticality assessment, and asset hierarchy development.

Dofasco also realized the need for an information technology infrastructure that would act as an enabler in conducting the process and practices in the most efficient manner. The result was an in-house developed software package Dofasco called the Intelligent Condition Monitoring System (ICMS), which is now being commercialized and marketed by Ivara Corporation under the name Ivara EXP (Expert Maintenance Program). This software supports their planning and improvement processes. ICMS helps DOFASCO manage the effectiveness of their maintenance operations and compliments their existing CMMS, which manages the efficiency of the work.

ICMS is based on the theory of reliability-centred maintenance and applies it using a rules-based system for equipment problem diagnosis, by making use of non-normal equipment status alarms and automated recommendation of corrective action. Maintenance staff collects data from appropriate equipment on the shop floor, either manually or electronically and downloads the data to ICMS for processing and analysis. Pre-set alarm levels based on manufacturers' specifications or the operational history of a specific piece of equipment indicate to the user when machinery is running at critical, alarm, warning, or normal capacity and alerts maintenance of specific problems. Once ICMS has identified a problem, it recommends the corrective action needed to be taken in order to avoid a functional failure on the equipment.

Dofasco's maintenance organization now had the necessary asset knowledge and could make it easily

accessible to everyone, resulting in the ability to do the right work at the right time.

The Result

As a result of the opportunity to employ these innovative practices and technologies, DOFASCO completely changed the operation of their maintenance department and achieved millions of dollars in savings.

Dofasco estimates that it saves \$2 million annually by using their Reliability Driven Maintenance Process to identify maintenance needs. Hourly employees were actively engaged throughout the process and were empowered with the necessary information to identify and correct problems before they became emergencies.

As a result, proactive maintenance activities have increased and reactive maintenance is less than 25% of all jobs. Prior to having an integrated equipment reliability database, the problem probably would have often gone undetected.

"A down blast furnace means \$30,000 in lost profit every hour," says Fred Dunbrack, Dofasco's Manager of Predictive Technology Services. "Instead of fighting fires, we are proactively managing our equipment, always know its health, and no longer have major equipment shutdowns due to failures."

In addition equipment availability has increased more than 10% and product quality yield has risen from 76% to 91%. As a direct result, Dofasco has not only been able to retain its existing customer base, it has also expanded and established itself in other industry sectors where consistent quality and just-in-time deliveries are essential customer requirements.

Dofasco also managed to reduce its maintenance workforce, through voluntary attrition, from 3,678 to 1,734 people. And finally, the spare parts inventory was reduced from \$110 million to \$70 million with a goal to lower it to \$50 million by the following year.

Conclusion

Dofasco is now North America's most profitable steel producer and was recently ranked as the #1 steel maker in the world by Dow Jones. At a recent Annual Canadian Maintenance Management Congress held in Toronto, Dofasco walked away with 2 prestigious awards. The first was for "Best Maintained Large Plant/Facility" and the second for "Best Use of Technology/Maintenance Innovation of the Year."