

Curbing the 'bad actors'

Reliability projects at zinc refinery save over \$7 million

BY CARROLL MCCORMICK

I have only met two people who referred to "bad actors" — in their parlance, they meant shady people best avoided. I sat up straighter then, when three top maintenance and operations brass at Canadian Electrolytic Zinc Ltd. (CEZinc), a zinc refinery in Valleyfield, Que., about 50 km west of Montreal, started talking about their "bad actors" list.

In their world, bad actors are the most maintenance-hungry, production-stopping equipment in the plant.

Since 2004 the maintenance department has been producing a monthly update of its top-20 bad actors list, which identifies the machinery that is simultaneously the most troublesome, but also is the most important to maintaining production.

Bad actors can be operationally defined in several ways: lost tonnes of production caused by their failure, the number of corrective work orders they inspire, the cost of repairs and the number of maintenance hours they gobble up. These variables are weighed against the equipment criticality, i.e., how crucial they are to the production process.

Having identified a suitably-notoriously bad actor, the maintenance department can get serious return for its dollars by doing a Root Cause Failure Analysis (RCFA); i.e., why does this thing fail, address the root cause and knock it off the list.

The first time CEZinc tried this was in a Six Sigma pilot project review of its cellhouse cranes and elevator in 1999. The cellhouse is where electrolysis converts zinc that is in solution to 99.9% pure zinc sheets on aluminum cathodes.

The cranes and elevator are critical to the cellhouse's operation — it's an equipment bottleneck. Over the previous three years, 19 breakdowns had cost an average \$677,000 a year, based on \$15,000 in lost production for every hour they shut down the cellhouse.

"We did a project to look for the root cause of the crane failures," says maintenance and reliability coordinator Michel

Côté. The project succeeded in almost completely eliminating breakdowns: between 2000 and 2004 maintenance logged only a single failure per year.

In November 2002, maintenance turned its sights on the cellhouse stripping machines, which peel the zinc sheets off the cathodes. That year, 15 events had caused 2,200 tonnes worth of production losses, but after doing a Root Cause Failure Analysis and introducing Reliability-Centred Maintenance (RCM) procedures, only three events, which caused production losses of just 293 tonnes, were logged between March 2003 and May 2005.

The analysis uncovered several areas where improvements were required. For example, says maintenance chief Alain Brazeau, "There was no standard way to do preventive maintenance. Goals we set included improving how we measure the wear of the components, improving how the machines are operated so as to reduce damage, and setting up the equipment so it doesn't damage itself."

The stripper project resulted in a fairly extensive rewriting of operating and maintenance procedures, including when it is most appropriate to do repairs on site, and when to swap out an assembly and repair it under more controlled conditions in the central repair shop.

However, notes operations manager Guy Bélair, "It is very rare that you come up with a big, expensive solution."

Dirt causes vibration

Take the Dynawave, an emission scrubber that removes dust during startup of the roaster, where the zinc concentrate is heated to 950°C to drive off the sulphur.

"We were having unexpected and unexplained bearing failures," says Côté. A Root Cause Failure Analysis revealed that the dirty gasses going to the blower dirtied the impeller, causing vibration and bearing failures. The solution was simple: periodically clean the dirt off the impellers.

In another case, an analysis of maintenance data turned up a high rate of

continued on page 24

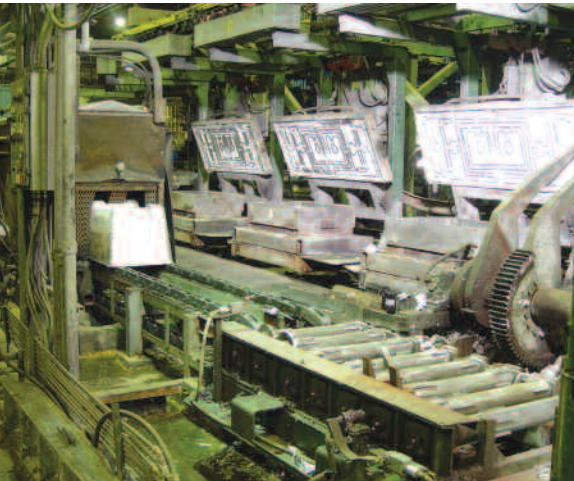


Identifying and eliminating the biggest sources of lost production has saved this Noranda zinc refinery millions. The tools used include Root Cause Failure Analysis (RCFA), Reliability-Centred Maintenance (RCM) and Six Sigma techniques.



Clockwise from top: Aerial view of the Valleyfield, Que., Canadian Electrolytic Zinc Limited; millwrights Gaétan Brazeau (left) and Jim St-Pierre (centre) and welder François Gervais; roasted zinc ore is leached in a solution of hot sulphuric acid to dissolve the zinc and other metals preparatory to zinc recovery; millwright Jean Tatonetti.

continued from page 23



Freshly-poured, still very hot zinc ingot, is in production.

Quick CEZinc facts

The CEZinc refinery, a property of the Noranda Income Fund, produces 275,000 tons per annum (tpa) of zinc ingots, jumbo, shot and powder, 470,000 tpa of sulphuric acid, 4,000 tpa of copper concentrates and 450 tpa of cadmium.

CEZinc has a maintenance team of 141, an annual budget of \$28 million, plus \$15 million for capital spending.

A total of 11,000 pieces of equipment are registered in the Maintenance Planning and Control computerized maintenance management system, which CEZinc has used since 1986.

The Reliability Project has saved an estimated \$7.4 million since 2001, including salary savings from letting attrition reduce the maintenance workforce from 170 to 141.

valve failures in the cadmium furnace. The solution was simple, but the remarkable thing was that maintenance had not even known there was a problem. As is often the case with data collection in a busy maintenance department, it is one thing to collect data and key them in, and another thing to find the time to analyze them for trends.

Since 1999, the maintenance department has spent a lot of effort, time and money — just how much, they keep under their collective blue hard hat — implementing reliability projects that are literally rewriting the refinery's approach to maintenance. For example, before Six Sigma, no one was looking at the number of man-hours put into the computerized maintenance management system (CMMS) for repairs. "Six Sigma forces you to collect data and take measurements," says Bélair.

"The most important thing is the change in culture. In the past we accepted that things would fail."

Beginning with the rule of thumb that 55 out of every 100 work orders could be avoided, CEZinc set out, simply put, to stop equipment from breaking by using reliability programs.

"It worked," says Côté. Roughly tallied, maintenance found that close to 60% of work orders could be avoided. Of that, 13% resulted from improper repairs, 18% from management decisions, 17% because of improper operation and 13% because the equipment was not engineered properly.

One of the drivers for change was the desire to wring more productivity out of the refinery by reducing downtime. Between 1996 and 2001, CEZinc had increased production from 224,000 to 275,000 tonnes per annum (tpa). "But once you have done that, you turn around and ask, 'how else can you improve productivity?'" Bélair says.

"Well," he continues, "there were people who told us that we could do maintenance better." CEZinc collected the proof from pilot projects that showed the effectiveness of reliability-based maintenance." Côté adds, "We had lots of numbers and projects that showed we could benefit from reliability maintenance."

In May 2005, the plant appointed an accountable engineer whose job it is to facilitate more identification and improvement of the bad actors. By September this year there will be three people dedicated to this. "We will be able to address more bad actors in every area of the plant," says Brazeau.

Maintenance has solved between 10 and 15 problems with bad actors already — success that fits nicely with other measures that help the team better understand the most effective ways to spend maintenance time and dollars.

For example, says Côté, "We were always doing inspections, but we are now doing them more efficiently. We are relating inspections to criticality. If there are no consequences on the safety of employees, the environment or production when it breaks down, do not spend maintenance dollars on it."

Brazeau sums up the team's goals: "We want to work on Reliability-Centred Maintenance, improve preventive maintenance, improve the planning and scheduling of maintenance, and improve the wrench time of the maintenance people." **MRO**

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