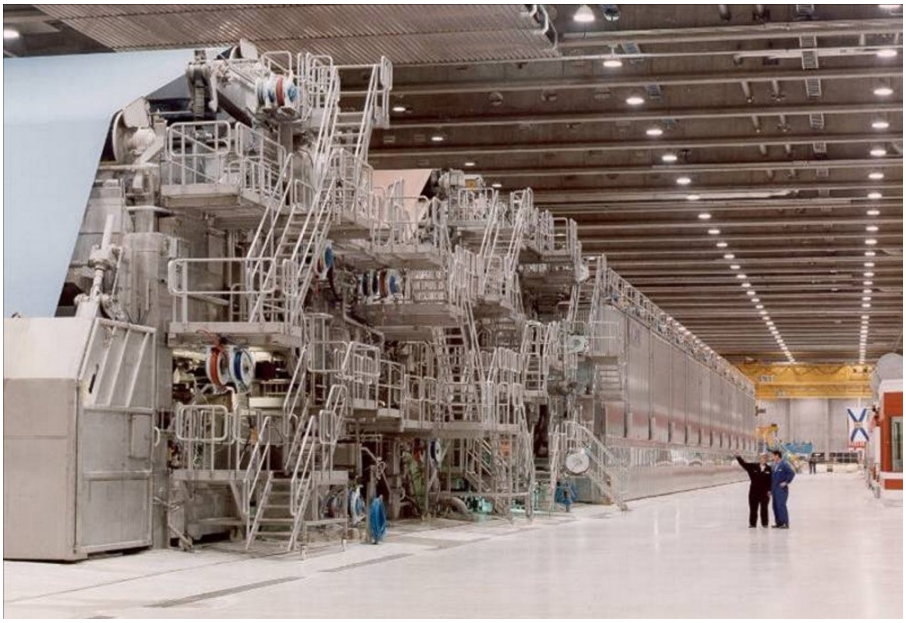
Reliability Centered Maintenance

Pulp & Paper Mill



In this case study the customer operates a 20 year old pulp and paper operation in eastern Canada. They are running one of the largest and fastest paper machines on the continent producing coated (shiny) magazine grades of paper.

Situation

The mill was built by a leading edge European pulp and paper company and later sold to its current owners. The processes on site begin with wood chips, produces paper at a maximum width of over 9 m running at up to 1,800 meters per minute, shipping 360,000 metric tons of super-calendared finished product – nearly 20% of North America's capacity.

Maintenance practices were initially created using manufacturers' recommendations and modified over the 20 years of operation to reflect the experience of the employees in operating and maintaining the mill. After several employees attended the Asset Management Association of Canada's, Maintenance Management Professional (PEMAC MMP) training, there was a growing recognition that some of those maintenance practices were in need of review and update. In particular, the Sulphur Dioxide (SO2) unloading and storage system likely had a number of risks that were not being addressed adequately.

SO2 is brought to the mill by rail car and truck as a pressurized liquid, unloaded to a pressurized storage system and diluted for use in the bleaching part of the operation. At atmospheric pressure and normal temperatures at the mill, the SO2 becomes gaseous, toxic and foul smelling. Working on or near the SO2 systems is hazardous and various precautions must be taken. There are various gas detection and alarm systems in and around the mill to warn of any releases.

To identify and address all the risks associated with this system, the Mill used our "Reliability Centered Maintenance – Re-engineered" (RCM-R®) method.

Training and Analysis

Only a few of the mill's employees had any training in RCM through the PEMAC MMP program. Those most familiar with the system had not had the training. It was necessary to provide training in the

92 Caplan Ave., Suite 624, Barrie, ON L4N 9J2 Canada
www.consciousasset.com info@consciousasset.com +1 705 408 0255

method and to facilitate this important analysis. Complicating the exercise was the 2020, Covid-19 pandemic. The mill was observing strict Covid-19 protection protocols and its location was in a part of Canada that was isolated from other, harder hit areas of the country. All the training and facilitation was carried out via video conferencing using half day long sessions spread over two weeks, 10 sessions in all.

The training was delivered live by our instructor, one of the authors of the RCM-R® book (2017) using the same course materials as our online training course. Mill attendees were enrolled in the online course to give them access to all course materials, quizzes (one per lesson) and the online scoring of their efforts. If anyone missed a live session, they could then catch up using the online lesson and avoid holding back the whole group.

In conventional RCM training and analyses the course is taught, tests are administered and certificates issues. The analysis work is carried out separately and often quite a bit later. Even with experienced facilitation, those analyses are usually slowed by the need to review course materials on the fly.

In this case we took a different approach, alternating training with analysis work. For each topic taught we then facilitated that part of the analysis. For example, we would teach a class on defining system functions, then record the actual functions of the system being analyzed. The class was able to put the training into immediate use. This enhanced the learning substantially, and it produced a top quality analysis facilitated by the instructor.

The online course includes some 14 lessons, each varying from 25 to 45 minutes in duration. Those were taught live. Attendees were split into small groups in separate meeting rooms with the course materials projected. Typed chat and voice were used for questions and answers. The same arrangements were used for the analysis, having it projected as it progressed. Line drawings of the system, its components and technical manuals were available in electronic format and easily shared. In total there were approximately 9 hours of lecture and discussion, 7 hours of quizzes and another 30 hours of analysis work.

The training and analysis sessions took place in the morning each day for just over a two week period. There was a major breakdown in the mill which interrupted for one day which was made up with two longer sessions and an extra day in the following week. Sessions started early, lasted an average of 5 hours with breaks, and concluded most days at lunch time.

Results

The old maintenance program for the system had comprised several alarm tests (mandated by regulations) and condition monitoring of system pumps. The analysis revealed some 186 failure modes with unique causes, 22 with potential safety and environmental implications, 27 that were “hidden” (largely in safety and backup systems) and another 59 that impacted on production capacity of the mill. The team identified 14 operator checks, 7 maintenance condition monitoring checks, 21 time based replacements, 15 tests and 20 changes to training and procedures that were needed.

Problems they had been experiencing were explained as they carried out the analysis and gained insight into how the system was both designed to operate and how they were operating it that led to some of the observed phenomenon.

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Participants were surprised at the depth of insight they gained into this system that they had been operating for over 20 years and left the exercise feeling much safer and more confident in the system. Here are some of their remarks:

- Got out of "component mode" and shifted to looking at functions. It's a new way of seeing things and it's easier to see to importance of implementing results.
- Safety valves were unknown before. Scrubber isn't monitored enough. More confident now. P&ID accuracy surprising. Learned a lot.
- Feel really good. Like the functional approach. Can see the differences between how it was designed and how it is run. Learning.
- Learned a lot, understand it now. Feel more comfortable with it. I'll feel better as we implement results.
- I'm not as shy now. Learned in detail how to do RCM. I got the theory through (other course) but now I have clarity on how to do it.
- Learned a lot. Liked this better than (other named) course. Success is from implementing afterwards. Put RCM in PM titles. The floor will be doing what makes sense and be safer.

During the analysis efforts the mill manager was hearing very positive feedback from the team and was impressed with what he heard. He indicated that they'll be using this method on more of their systems.

To learn more

If you are considering Reliability Centered Maintenance, you will want to talk to us. We've been doing it since before our company was formed. In fact our principal has been doing it since the 1980's – before the first books and standards were even written. We know what works and what doesn't. There is more to RCM than meets the eye and we are happy to share our insights and experience with you.

E: info@consciousasset.com

T: +1 705 408 0255 then dial 1 for James or leave a message at our general Voice Mail box.