RWM
RESOURCE & WASTE MANAGEMENT EXPO
PREVIEW

July/August 2023 | Issue 81

HUB 4 TM
QUARRYING · RECYCLING · BULK HANDLING

Global News & Information on the Quarrying, Recycling & Bulk Materials Handling Industries

Check out the very latest industry news at www.hub-4.com

Justifying Conveyor Upgrades Part 2: Ensuring a Positive Outcome

R. Todd Swinderman, P.E. / President Emeritus / Martin Engineering

In Part One of this two-part series, we covered how supervisors or managers in charge of writing proposals for upgrading conveyor equipment could create persuasive arguments and set real-world expectations for the capital expenditure. Part Two is intended to ensure that the proper data is collected to justify the project and build trust with stakeholders so future proposals will also be accepted.

"Collecting the proper data and presenting convincing arguments is almost an art form," said Dan Marshall, Process Engineer at Martin Engineering. "The first few times you do it can be frustrating and tedious. But reviewing some of the company's past proposals -- including those that were rejected -- is always educational. Working with the manufacturer of the proposed equipment can also be extremely helpful."

Project planning can be time-consuming, so schedule quiet desk hours to focus.

Choosing the Right KPIs

Measuring performance requires data, so determining the most relevant Key Performance Indicators (KPIs) is important. These measurements help create evidence for stakeholders so they can make informed budget decisions. From a single piece of equipment to an entire project involving multiple components, KPIs should be part of any strategic process to assess performance and help set objectives. Often displayed in graphs or charts for visual effect, performance measurements relay trends and progress related to a goal that can be easily recognized and absorbed.[1]

There are two types of KPIs, leading and lagging. Leading KPIs are those that indicate future problems which can cause expensive unscheduled downtime, such as Mean Time Between Failure (MTBF). Lagging KPIs are those that happen during or after downtime, such as "reactive maintenance." Keep in mind that KPIs require a reasonable period to collect the data, sometimes stretching across an entire year or more. Benchmarks by which to measure the failure or success of the performance metrics are essential.

Common Types of Bulk Handling KPIs:

1) Unscheduled Downtime – Labor and servicing during an emergency shutdown are estimated to be three to seven times more expensive than scheduled downtime when workers are not pulled from other essential duties and contractors have time to offer competitive estimates. For example, just a one-percent difference in system availability for a coal-fired power plant could be worth one to two million US dollars in annual revenue. The cost of even the shortest unscheduled outage is prohibitive.

When calculating the cost of downtime, common expenses to include are:

A. Lost opportunity cost (missed sales, supply line impact, etc.)

B. Purchase of replacement components

C. Maintenance labor

D. Subcontractor labor

E. Consulting and engineering fees

F. Testing and analysis

2) Labor Costs and Fees – Although these are included in determining the cost of unscheduled downtime, they are both leading and lagging KPIs, essential budget line items to determine the viability of any pending project. All maintenance related to the targeted project component(s) should be logged, including servicing of the system leading to and from the component(s).

3) Direct and Indirect Costs – Direct costs can include labor, but generally also cover replacement equipment, contractor costs, production losses and injuries. Indirect costs are investigations and settlements as a result of injuries or accidents, increased energy usage, increases in insurance premiums, MSHA or OSHA fines and qualitative costs like poor morale, etc.

4) MTBF – Mean time between failures is the average uptime between unscheduled outages. It is a vital performance metric to measure safety and equipment design and aids in determining new equipment's return on prevention (ROP) as compared to existing equipment.[2] ROP is an abstract representation of the potential economic success of occupational safety and health. Equipment with a better ROP is generally higher quality, with less maintenance required. It can be expected to carry a somewhat higher purchase price, so MTBF is key to justifying the cost and safety benefits.

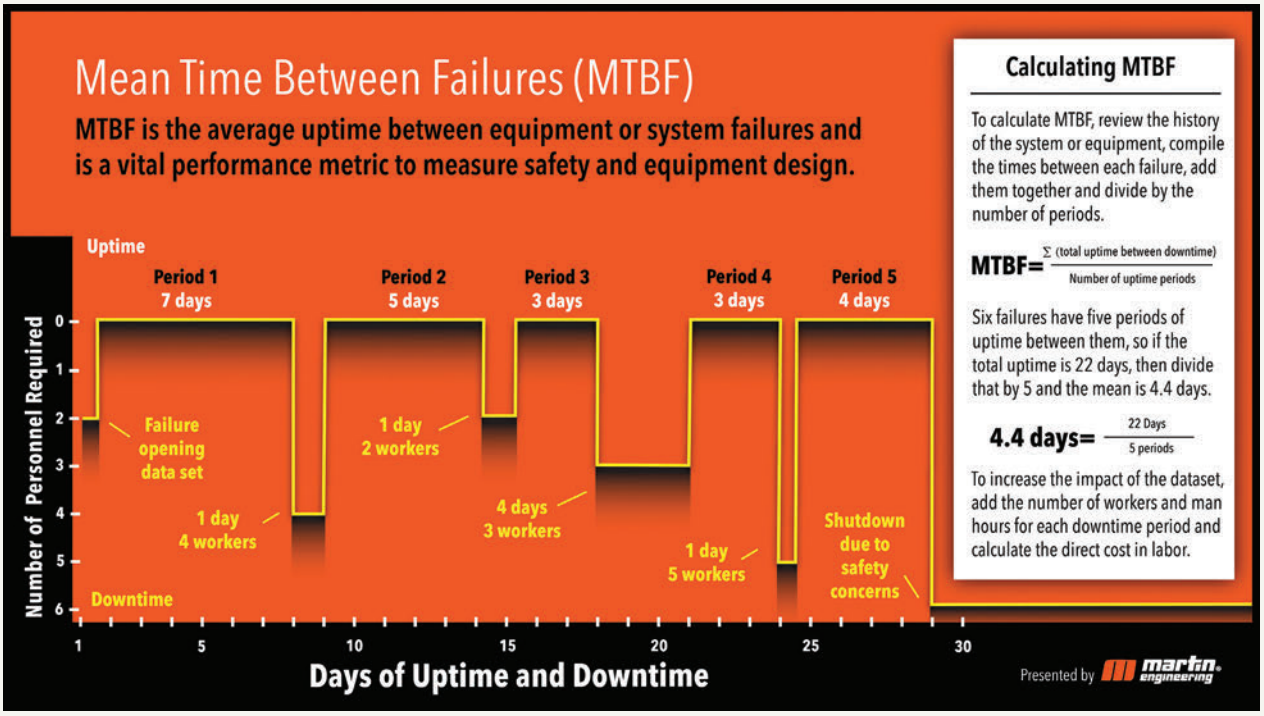

Figure 1 – MTBF calculated over a sample period.

$$\text{Opportunity Cost} = \frac{\text{tons}}{\text{hour}} \times \text{Unplanned Downtime (hours)} \times \left[\frac{\text{Sales(\$)}}{\text{ton}} - \frac{\text{Cost of Sales(\$)}}{\text{ton}}\right]$$

Figure 2 – Opportunity cost calculation.[2]

To calculate MTBF, review the history of the system or equipment, compile the times between each failure, add them together and divide by the number of periods. For example, six failures have five periods of uptime between, so if the total uptime is 22 days, dividing that by five makes the mean 4.4 days. To increase the impact of the dataset, add the number of workers and man-hours for each downtime period and calculate the direct cost in labor. [Fig.1]

5) Opportunity Cost – Opportunity cost is the value of production lost due to unscheduled events such as machine breakdowns, shutting down to clean up fugitive material or safety incidents. The concept is that if the product is not available for processing, and therefore sale, a profit opportunity is lost. [Fig.2]

Project Management

The success or failure of a project can come down to good project managers. They manage the schedule and budget to ensure that work is completed on time, and on budget. Establishing reasonable and clear expectations for co-workers, vendors and subcontractors helps ensure the quality of the finished product. Some manufacturers offer conveyor inspections and cleaner maintenance as part of a managed service relationship. Their monitoring systems can track component wear and update the service technician and/or operations personnel via wi-fi or cell phone on upcoming service needs. Some new systems can even adjust belt cleaner tension automatically, and the technology will also send an alert through a mobile app in the event of upset conditions.

Factory-trained service technicians provide an added set of eyes on the conveyors, travelling to and from the equipment to be serviced and logging details in their service reports. Because they see so many different applications, they can often alert on problems that maintenance personnel don't see or have become accustomed to ignoring. With factory-direct managed service, the responsibility for maintenance falls on the manufacturer, allowing the staff to focus on other priorities.

At first glance, it may seem that a plant has the in-house capacity to maintain belt cleaners, and hiring a managed service provider doesn't make sense. The reality is a conveyor will run with a belt, a head and tail pulley and a drive – maintaining everything else can be put off (and often is) for production at any cost. A "run until broken" philosophy means more than non-functioning equipment – it can increase unplanned downtime, exacerbate financial issues and affect worker morale, too. Then, in the rush to patch things together, maintenance workers are tempted to take shortcuts and work around established procedures, exposing them to greater potential for injury. In contrast, a service contract that employs factory-trained technicians will often result in problems being identified before they become catastrophic failures, reducing downtime and further equipment damage.

Factory-trained direct service personnel and replacement parts are key to obtaining expert maintenance for optimum performance and component life, leading to on-time deliveries and high customer satisfaction. Some manufacturers will even supply free remote monitoring and reporting equipment that's accessible by wi-fi or cell phone. These managed service technicians, supported by a financially stable, well-established manufacturer and armed with the specific knowledge and equipment to do the job, are often the answer to common belt

Trained service technicians identify when equipment needs servicing and give reasonable timelines and budget.

cleaning problems. For these technicians, who spend every day assessing and servicing belt conveyors, maintenance and repairs become more of a precise science than a judgement by rule of thumb.

Regular inspections by factory-direct professionals help minimize downtime and improve efficiency.

Collaborating with factory-trained technicians delivers the most economical solutions.

Safety Justifies Success

If the argument for workplace safety is made clearly and robustly in the proposal, then showing significant safety improvements after the project has closed is always a top-tier outcome. Overseeing the proper installation of high-grade equipment that achieves what it was engineered to do should yield a positive outcome, barring any major unforeseen catastrophe.

The key is to work closely with the manufacturer or engineering firm, monitor results closely, and address issues early. Regularly-scheduled reviews of conveyor belts, cleaners, tracking, chutes, dust control and other components from experienced specialists with extensive training and expertise will help conveyor operators maximize productivity and reduce downtime.

"The earlier service technicians are brought into the process, the more they can assist," Marshall added. "We often walk the belt and inspect conveyor systems along with operators to find practical solutions that can help define their KPIs, narrow the scope of data collection and get them to their goal faster and more safely."

References

[1] Swinderman, R. Todd; Marti, Andrew D.; Goldbeck, Larry J.; Marshall, Daniel; Strebel, Mark G.: Foundations; Fourth Edition; pg. 465, pg. 443; Martin Engineering; Worzalla Publishing Company; Stevens Point, Wisconsin 2009.https://foundations.martin-eng.com/foundations-4-book-download

[2] Swinderman, R. Todd; Marti, Andrew D.; Goldbeck, Larry J.; Marshall, Daniel; Strebel, Mark G.: Foundations for Conveyor Safety; First Edition; pg. 451; Martin Engineering; Worzalla Publishing Company; Stevens Point, Wisconsin 2009. https://foundations.martin-eng.com/foundations-4-book-download