

A New Approach To Minimizing Downtime In Highly Automated Operations

White Paper

Facilities throughout the supply chain are increasingly installing large scale automation process and handling technologies that require readily available routine maintenance supplies and spare parts inventory to avoid costly downtime.



Introduction

Automated systems and technologies, long deployed by manufacturing facilities, are now moving further into the supply chain to support distribution and fulfillment operations. Indeed, as *The U.S. Roadmap for Material Handling & Logistics* noted:

The benefits of automation for material handling and logistics applications are many: Machines are more reliable, do not tire or make routine errors; conveyors move packages much more quickly than workers could carry them; automated systems incur lower labor costs; workers are less prone to occupational injuries; and, in many applications, automation is more cost-effective.¹

Investment in automated systems and technologies shows no signs of slowing. Domestically, the Manufacturers Alliance for Productivity and Innovation (MAPI) forecasts inflation-adjusted investment growth of 10.3% in automation equipment for 2015.² That aligns with the global market analysis for worldwide automation investment, with an estimated compound annual growth rate (CAGR) of 8.08% from 2013-2018.³

Domestic Industrial Automation Growth

IHS Industrial Automation's manager and principal analyst Alex Chausovsky saw 6.3 percent growth in the automation machinery market in 2014, and anticipates the Americas becoming the dominant growth engine for industrial automation sector, with sales growing by 6.9 percent.



DATA AND GRAPHIC SOURCE: Greenfield, Dave. "Motors and the Americas Drive Industrial Growth," *Automation World*, <http://www.automationworld.com/motors-and-americas-drive-industrial-growth>, accessed December 4, 2014.

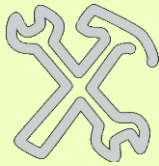
¹ Kevin Gue, ed., "The U.S. Roadmap for Material Handling & Logistics," <http://www.MHLRoadmap.org>, 47.

² Modern Materials Handling, "MAPI Economic Forecast: Investment spending to drive growth," <http://www.mmh.com/article/mapi-economic-forecast-investment-spending-to-drive-growth>, accessed November 24, 2014.

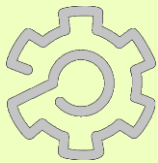
³ R and R Market Research, "Smart Factory Market by Technology (SCADA, DCS, PLC, ERP, MES, PLM, MOM), Field Devices (Industrial Network, Robotics, RFID, And Motors & Drives, Relays & Switches, & Sensors), Application (Process, Discrete) - Global Forecast & Analysis (2013 - 2018)," <http://www.prnewswire.com/news-releases/225b-smart-factory-market-automation-analysis-and-2018-forecasts-279319442.html>, accessed November 24, 2014.

With expanding, multi-million-dollar investments in large-scale automation systems—conveyors, sorters, palletizers, robotics, case erectors and sealers, packaging equipment and more—comes substantially greater emphasis on keeping everything running at peak levels of productivity. Ensuring an automated facility’s maintenance and repair operations (MRO) are properly equipped with routine preventive maintenance supplies, tools and critical spare parts is essential to ensuring system uptime.

Types of maintenance⁴:



Corrective Maintenance – Also known as Breakdown Maintenance, this is the most common type of maintenance, and is performed when a piece of equipment experiences a hardware or software failure. The goal is to get the equipment back to working order as quickly as possible and minimize unexpected—and costly—production downtime. The repairs themselves can be considerably expensive, as expedited spare parts acquisition and overtime man-hours are often required.



Preventive Maintenance – Also known as Planned Maintenance, this involves performing maintenance in an effort to avoid equipment breakdown and failures. Preventive maintenance can be further broken down into Periodic Maintenance and Predictive Maintenance.



Periodic Maintenance – Time-based maintenance requiring periodic checks that include inspecting, servicing and cleaning of the equipment. Replacing gaskets, lubricating friction points and inspecting for wear are common activities.



Predictive Maintenance – Utilizing data about the equipment and its operation to anticipate wear conditions. Through analysis of use trends, deterioration diagnoses, and information about the expected useful life of components, maintenance is scheduled and performed in a manner that maximizes the parts’ useful service life.

⁴ CMMS Pro, “Types of Maintenance,” <http://www.cmmspro.com/types-of-maintenance.asp>, accessed December 4, 2014.

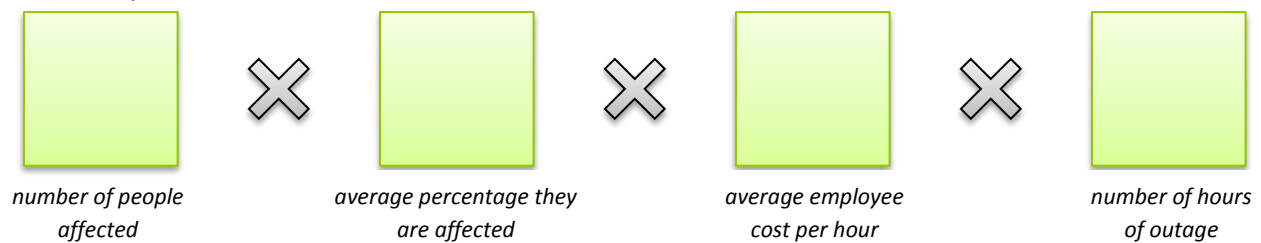
This white paper offers a formula to calculate the potential cost of downtime associated with automated equipment failure, and outlines the benefits of a small-scale investment in automated storage and retrieval equipment to maximize MRO efficiency.

The Potential Cost of Downtime

The shutdown of an automated system, whether scheduled for routine preventive maintenance activities or unexpected due to a faulty or defective component that must be replaced, is costly. The potential costs can be calculated based on three factors: labor costs, lost revenue and service costs.^{5 6}

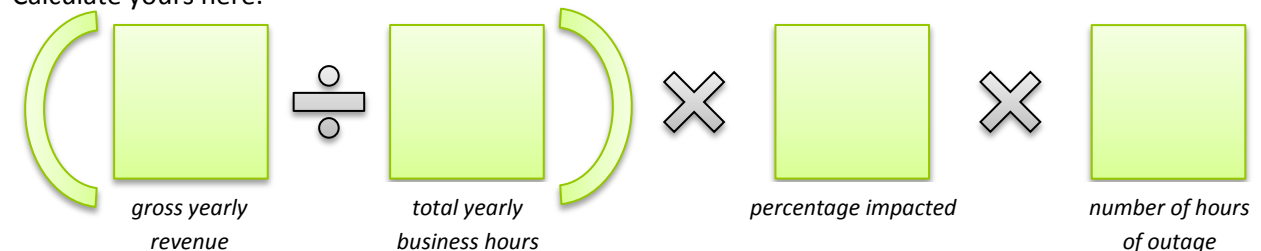
Labor Cost = P x E x R x H

Calculate yours here:



Lost Revenue = (GR/TH) x I x H

Calculate yours here:



Service Costs

Further, and harder to calculate, are service costs. These might include:

- Late delivery surcharges from customers
- Overtime pay required to compensate for productivity losses
- Delayed shipments that result in decreased customer satisfaction or loss of customers
- Rush and overnight shipping costs associated with requiring a needed service part not maintained in MRO inventory onsite

After adding up those (and other) service costs, divide the total by the number of hours of system downtime to calculate cost-per-hour.

Careful consideration of all of these three areas of potential costs and losses from automated system downtime has more companies evaluating alternative solutions to support in-house MRO practices.

⁵ North American Systems International, "The True Cost of Downtime," http://www.nasi.com/downtime_cost.php, accessed November 23, 2014.

⁶ Ibid.

Small-Scale Automated Storage and Retrieval Systems Support MRO

Because of the high value of these systems, and because of the potential high costs associated with their downtime, many companies invest in hiring a team of in-house MRO professionals charged with automation support. To do their jobs properly, companies also have to invest in a certain amount of preventive maintenance supplies, tools and critical spare parts.

Yet, many operations new to automated systems have never had to maintain this type of MRO inventory. Having the “right part, right place, right quantity and right time is as important in maintenance as in order fulfillment. It’s also a balancing act, since no one wants to shut down operations because a repair isn’t available. At the same time, no one wants to invest more in expensive repair parts than is needed to keep a facility running.”⁷

To help companies find balance, large-scale automation solutions providers typically recommend a package of key spare parts to keep on hand. But just having the parts somewhere in the building, unaccounted for and in potentially questionable storage conditions, can leave them prone to becoming lost or damaged.

Further, for companies that do designate a storage room or area for MRO supplies, tools and spare parts, the space is usually small. That’s because most operations prefer to allocate valuable square footage for profit-generating purposes, rather than facilities support.

As an alternative, small-scale automated storage and retrieval systems can provide highly dense storage in an extremely compact footprint for a fraction of the dollars invested in the large-scale automation equipment it supports—particularly when considering the costs of operational downtime.



A typical maintenance department with standard shelving is shown on the left. A Megamat RS vertical carousel provides clean, organized and compact maintenance parts storage, as shown below.



⁷ Trebilcock, Bob. “MRO moves to materials handling,” *Modern Materials Handling*, http://www.mmh.com/article/mro_moves_to_materials_handling, accessed November 24, 2014.

Three primary types of automated storage and retrieval include:

Vertical Carousels – Comprised of a series of shelves that rotate around a track—similar to a Ferris wheel—these automated storage and retrieval systems deliver stored items safely and quickly to an ergonomically positioned work counter at the operator’s command, eliminating walk and item search time.⁸



Vertical Lift Modules (VLMs) – An enclosed automated storage and retrieval system that consists of two columns of trays with an inserter/extractor in the center. The inserter/extractor automatically locates and retrieves stored trays from both columns and presents them to the operator at a waist-high access window, eliminating travel and SKU search time.⁹



Horizontal Carousels – Consist of bins mounted on an oval track that rotate horizontally to deliver storage locations to an operator. These automated storage and retrieval systems eliminate unproductive travel and search time by delivering the product to an operator.¹⁰



How Automated Storage and Retrieval Systems Benefit MRO in Highly Automated Operations

Highly automated facilities that implement small-scale automated storage and retrieval systems to support MRO activities will benefit in a variety of areas. Among them:

- **Centralized Storage:** By implementing an automated storage and retrieval system dedicated to the storage of maintenance supplies, tools and spare parts, an operation can be assured that all items are kept in a centralized, designated location. With everything stored in one or two automated storage units, items can be easily found and accessed, minimizing search time.
- **Better Organization:** To help maintenance technicians find the items they need even faster, the equipment can be outfitted with partitioned trays or totes for organization and easy location of small components, such as screws, nuts and bolts. If the machine is also integrated with

⁸ MHI, Order Fulfillment Solutions Industry Group, “Vertical Carousels,” <http://www.mhi.org/ofs/solutions-guide/vertical-carousels>, accessed November 24, 2014.

⁹ MHI, Order Fulfillment Solutions Industry Group, “Vertical Lift Modules,” <http://www.mhi.org/ofs/solutions-guide/vertical-lift>, accessed November 24, 2014.

¹⁰ MHI, Order Fulfillment Solutions Industry Group, “Horizontal Carousels,” <http://www.mhi.org/ofs/solutions-guide/horizontal-carousels>, accessed November 24, 2014.

inventory management software, stored items can be tracked and located by quantity, length of time stored, or their association to each individual type of automated equipment and the maintenance it requires.

- **Track and Trace Accountability:** The inventory management software can also provide traceability. To access stored contents, authorized operators can be required to first input a software-traceable personal login and password. For operations that wish to keep track of consumables (such as lubricants and filters) or shared tools and gear (from screwdrivers and ratchets to welding helmets and other safety items) required to service equipment, this additional measure of accountability allows depleted, missing or misplaced items to be quickly tracked back to an individual.
- **Parts Protection:** Because the automated storage and retrieval machines can be fully enclosed, the supplies, tools and spare parts stored inside are protected from exposure to the dirt and dust common to distribution and fulfillment operations. This maximizes the useful life of the items, preventing scrap and waste.
- **Maximum Storage Density:** Installing high-density automated storage equipment significantly reduces the amount of square footage required to store MRO parts and supplies. The equivalent amount of items held in 120 bays of static shelving can be condensed into two horizontal carousels (66% space savings), two vertical carousels (75% space savings) or a single vertical lift module (85% space savings). To further maximize cubic density, VLMs employ a sensor that measures the height profile of each storage tray's contents, then allocate the trays dynamically at incrementally variable heights. This permits storage trays to be placed within 1-inch of each other, producing up to 50% more storage capacity.
- **Enhanced Ergonomics:** Because MRO spare parts, components and consumables—such as motors or bulk quantities of lubricants—can be heavy and difficult to move, technicians may be reluctant to store the heavier items on shelving. But leaving these items on the floor can pose a trip hazard. Alternatively, every item stored in an automated storage and retrieval system is delivered at the correct ergonomic work height. Called the “Golden Zone,” the unit's opening is positioned waist-high, eliminating bending to retrieve an item stored low, or stretching to grab an item stored high. Further, the system minimizes unnecessary or excessive motions required for retrieval of items from drawers or shelves, including lifting, reaching, walking, stretching, bending, pushing, pulling, twisting, spinning or stooping. The automated storage equipment substantially lessens the chance of injury and absenteeism, while also reducing insurance premiums and claims for worker's compensation.

To learn more about how implementing an automated storage and retrieval system to support your automated operation's MRO activities, contact your Kardex Remstar representative today.

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About Kardex Remstar

Kardex Remstar, LLC, a company of the Kardex Group, is a leading provider of automated storage and retrieval systems for manufacturing, distribution, warehousing, offices and institutions. For information about the company's dynamic storage solutions, call 800-639-5805 or visit www.KardexRemstar.com.