Research suggests significant benefits to investing in advanced machinery maintenance

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The maintenance of machinery in the manufacturing industry consists of three primary approaches: reactive, preventive, and predictive. Reactive maintenance is when a manufacturer runs the machinery until it breaks down and requires maintenance. Preventive maintenance is when maintenance is scheduled based on time or cycles. This is similar to changing a car's oil after 3 months or 3000 miles. Lastly, predictive maintenance is based on data and observations. This is similar to how newer cars track different variables and indicate when the oil needs to be changed.

Previous NIST research, published in NIST AMS 100-18, indicated that there were a wide range of estimates for the costs of machinery maintenance in manufacturing. Additionally, the studies that estimated these costs came from a number of different countries, making it difficult to understand the costs associated with U.S. manufacturing. For this reason, NIST collected data in its Machinery Maintenance Survey to better understand maintenance costs. The results of this data collection is published in NIST AMS 100-34.

According to the results in AMS 100-34, on average, establishment maintenance practices were 17.3 % predictive maintenance, 31.8 % preventive maintenance, and 45.7 % reactive maintenance. Although reactive maintenance is the largest of the three, there are significant losses associated with it. Those establishments that relied heavily on

reactive maintenance (i.e., those in the top 25 %) were associated with 3.3 times more downtime, 16.0 times more defects, 2.8 times more lost sales due to defects from maintenance, 2.4 times more lost sales due to delays from maintenance, and 4.89 times more inventory increases due to maintenance issues. Moreover, there are a number of benefits to using preventive and predictive maintenance. Among those establishments that primarily rely on preventive and predictive maintenance, predictive maintenance was associated with 15 % less downtime, 87 % lower defect rate, and 66 % less inventory increases due to maintenance issues.

Preventable losses were not insignificant, totaling $119.1 billion: $18.1 billion due to downtime, $0.8 billion due to defects, and $100.2 billion due to lost sales from delays and defects. Additionally, an estimated 16.03 injuries and 0.05 deaths per million employees were associated with these maintenance issues. The implication is that for some manufacturers, there may be significant benefits to investing in maintenance. Currently, there are a number of NIST projects engaged in advancing the standards and methods for machinery maintenance to make these types of investments more reachable.

More information: Douglas S Thomas. The costs and benefits of advanced maintenance in manufacturing, (2018). DOI: 10.6028/NIST.AMS.100-18

Douglas S Thomas et al. Economics of manufacturing machinery maintenance:, (2020). DOI: 10.6028/NIST.AMS.100-34

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