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The Hidden Cost of MRO Failures

Industry survey sheds light on reasons for early retirement of capital asset.

Contributing Authors

Saurabh Bansal ◆ V. Daniel R. Guide ◆ Sergey Naumov
Kusumal Ruamsook ◆ Steve Tracey

The Center for Supply Chain Research®
Smeal College of Business, The Pennsylvania State University

In collaboration with:



TABLE OF CONTENTS

Introduction.....	2
Overview of MRO Challenges in Enterprise Asset Maintenance	2
Respondent Profile.....	3
Survey Results	4
Circumstances of Asset Retirement.....	4
Reasons for Asset Retirement.....	5
The Role of Spare Parts in Asset Retirement	5
Conclusions and Follow-On Study	7
References.....	8

List of Figures

Figure 1: MRO Challenges and Effects	3
Figure 2: Respondent Industry Sector	3
Figure 3: Respondent Job Role.....	4
Figure 4: Circumstances of Asset Retirement.....	4
Figure 5: Reasons for Asset Retirement.....	5
Figure 6: Remaining Useful Life of Asset Retired After Full Depreciation but Prior to End of Useful Life Due to Lack of Spare Parts	6

List of Table

Table 1: Respondent Comments on Reasons for Asset Retirement	7
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INTRODUCTION

Maintenance, repair, and operations (MRO) items—including spare parts, materials, industrial supplies, and services used in production processes—are critical components of enterprise asset maintenance. While MRO items do not become part of or are central to the finished product, they are necessary to keep plant and facility assets operating safely at optimal levels of performance. Companies spend between 5 and 10 percent of their cost of goods sold on MRO purchases. However, we are not interested in these direct and visible costs of MRO, but rather in something less apparent and potentially more sinister. We are interested in the hidden costs when MRO parts are *not* available, and assets must be retired—what we call an *MRO failure*.

A phenomenon that has plagued companies across industrial sectors, an MRO failure can prove to be expensive and challenging to manage. When an asset can no longer be repaired, then it must be replaced, and these costs are largely hidden since they may not be directly reported. To further an understanding on these issues, an on-line survey was conducted during October–December, 2022, by the Center for Supply Chain Research (CSCR)[®] in the Smeal College of Business at The Pennsylvania State University. The study was conducted in collaboration with SDI, a leading digital supply chain services firm specialized in MROs, and Ivaldi Group, a leading company that helps heavy industry shift to digital distribution, building a safe, convenient, cost-effective and environmentally friendly portal for sending files, not parts.

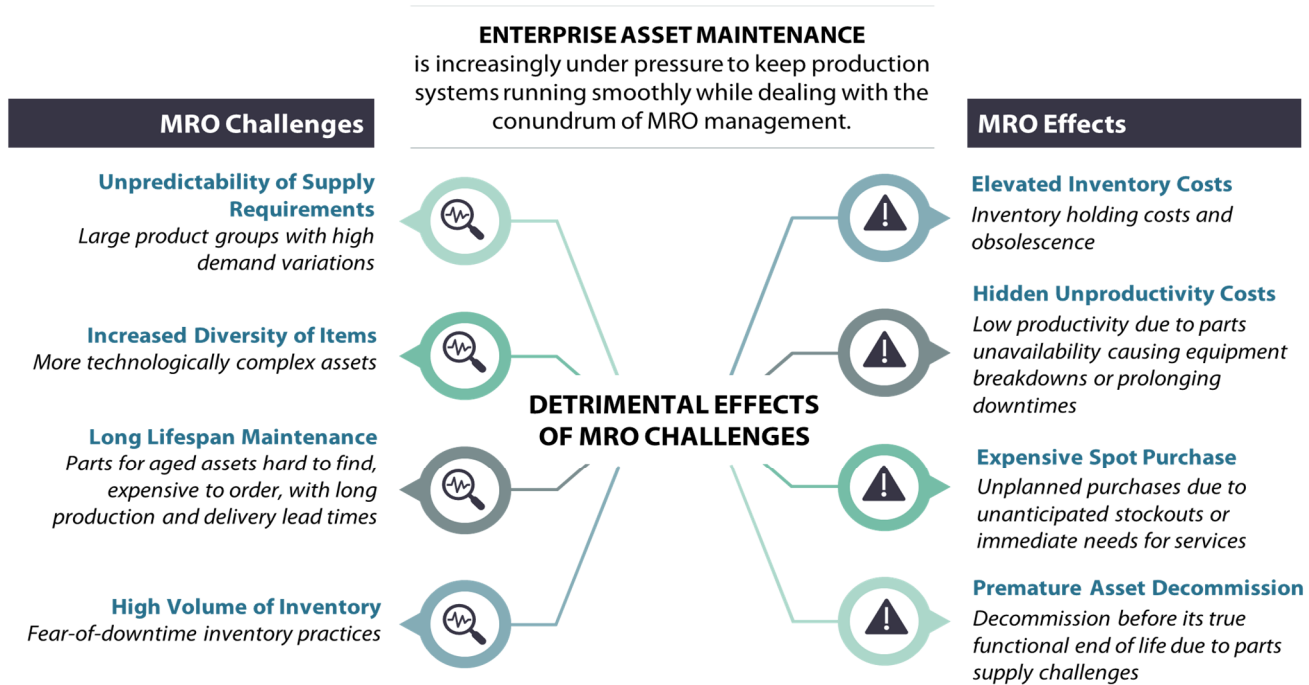
Our objective is to get insights into how firms manage their capital assets lifecycles. Specifically, the survey seeks to provide clarity about the causes of three asset retirement circumstances, namely prior to full depreciation, after depreciation but before the end of its useful life, and after the asset's useful life. This report presents the findings from the survey study.

OVERVIEW OF MRO CHALLENGES IN ENTERPRISE ASSET MAINTENANCE

Enterprise asset maintenance must deal with the increasingly complex landscape of MRO management as illustrated in Figure 1. MRO inventories are often highly uncertain and characterized by high demand variations. Today's firms also employ more technologically complex assets, resulting in increased diversity of MRO items required. Moreover, firms are trying to increase the lifespan of expensive assets, but increased lifespans can make parts harder to find, and often with longer production and delivery lead times. When parts are unavailable for any reasons, productivity suffers from lengthy, unplanned downtimes. These challenging MRO characteristics, combined with fear of downtimes, often cause MRO inventory levels to rise, with damaging repercussions of high inventory costs due to obsolescence and holding costs. Eventually, assets with spare parts supply

uncertainty may result in the premature retirement of assets. All of these factors make MRO management especially challenging and expensive.

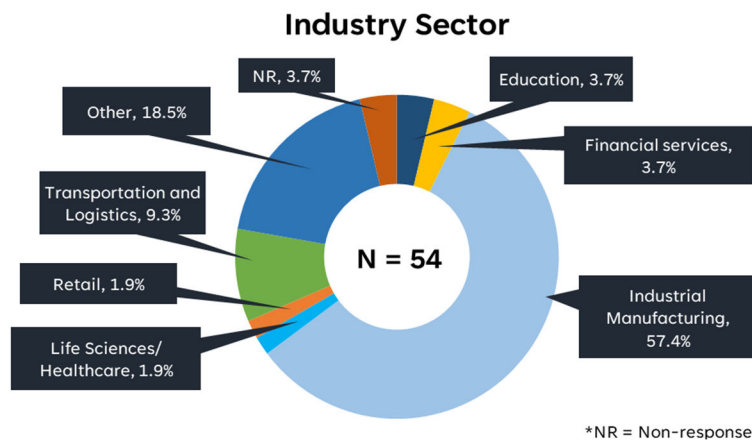
Figure 1: MRO Challenges and Effects



Source: Center for Supply Chain Research®, The Pennsylvania State University¹

RESPONDENT PROFILE

Figure 2: Respondent Industry Sector



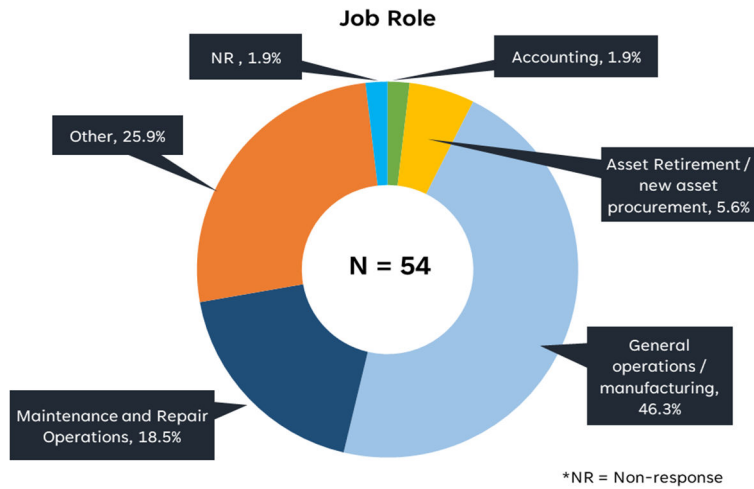
A total of 166 practitioners participated in the survey and there was a total of 54 complete responses. The majority of respondents reported over 20 years of professional experience (74.1%). Of the remaining respondents, 7.4 percent have between 10 and 20 years of experience, 16.8 percent less than 10 years' experience, and 1.9 percent did not respond.

As shown in Figure 2, the industry affiliation of survey respondents varies widely, with the largest group in the manufacturing industries (57.4%), followed by the transportation and logistics (9.3%),

¹ Discerned from AMFG 2020; Dryden Group n.d.; Ganeriwalla and Valluru 2016; InfoSys 2018; Tenzing Consulting 2018

financial services (3.7%), education (3.7%), retail (1.9%), and healthcare (1.9%). The rest of respondents consists of ten (18.5%) who were from other unspecified industries, and two (3.7%) who did not respond to this question.

Figure 3: Respondent Job Role



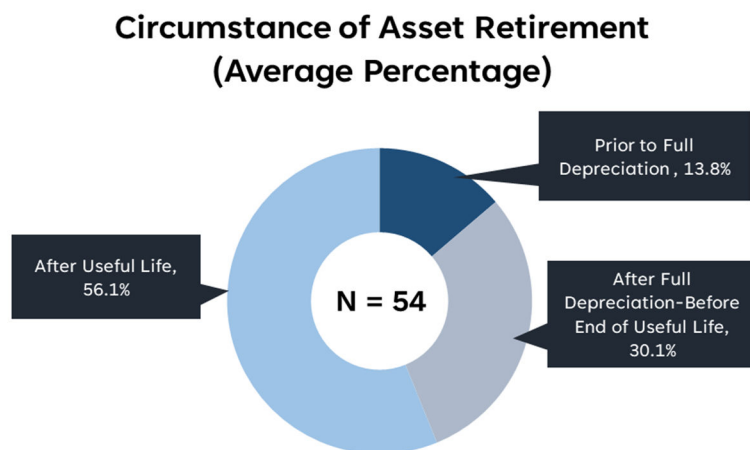
Respondents reported a wide variety of job roles (see Figure 3), with the majority of respondents working in general operations / manufacturing (46.3%), followed by maintenance and repair (18.5%), asset retirement / procurement (5.6%), and accounting (1.9%). The remaining respondents reported other job roles (25.9%) or did not report (1.9%).

SURVEY RESULTS

Circumstances of Asset Retirement

Figure 4: Circumstances of Asset Retirement

Survey: Please provide percentages of major capital assets retired in the last 2–5 years across three stages.



We asked respondents to provide a breakdown of the circumstances of their asset retirement in the last 2–5 years. As shown in Figure 4, their asset retirements range from those prior to full depreciation (13.8%), those after full depreciation but before end of useful life (30.1%), to those after useful life (56.1%). Notably, these results suggest that almost half of all assets were retired before the end of useful life.

Reasons for Asset Retirement

In surveying the reasons behind their asset retirement, two dominant reasons emerged as shown in Figure 5. In the cases of asset retirement prior to full depreciation, the primary reason was that better equipment became available (34.4%), followed by the situations where MROs became difficult to acquire (26.6%). The two primary reasons for asset retirement after useful life were surprisingly similar, including availability of better equipment (35.2%) and difficulties of MRO acquisition (30.5%). These results suggest that an MRO failure is a consequential factor in asset retirement.

Figure 5: Reasons for Asset Retirement

Survey: Please provide percentages of major capital assets retired in the last 2–5 years due to better equipment becoming available, MRO becoming difficult to acquire, equipment no longer needed, equipment not meeting market need, and others.

Reasons for Asset Retirement (Average Percentage)

Prior to Full Depreciation			After Useful Life		
Better equipment became available 34.4	MROs became difficult 26.6	Equipment was no longer needed 16.1	Better equipment became available 35.2	MROs became difficult 30.5	Equipment did not meet market need 20.4
	Equipment did not meet market need 15.5	Others 7.3		Equipment was no longer needed 9.5	Others 4.4

The Role of Spare Parts in Asset Retirement

In exploring specific role of spare parts in asset retirement after full depreciation but prior to end of useful life, results show that assets were often retired with almost half of the useful life remaining due to lack of spare parts (see Figure 6). These results indicate that a lack of spare parts plays a key role in MRO failures. Comments offered by respondents as summarized in Table 1 provide a telling picture of the challenges associated with MROs in terms of availability, lead times, costs, and obsolescence.

Figure 6: Remaining Useful Life of Asset Retired After Full Depreciation but Prior to End of Useful Life Due to Lack of Spare Parts

Survey: Please provide percentages of major capital assets retired in the last 2–5 years after full depreciation but prior to end of useful life due to lack of spare parts across five remaining-life stages.





Retired Assets Due to Lack of Spare Parts (Average Percentage)

Remaining Useful Life of Asset Retired After Full Depreciation but Prior to End of Useful Life Due to Lack of Spare Parts			
0-20% of Useful Life Remaining 49.5	20-40% of Useful Life Remaining 24.6	40-60% of Useful Life Remaining 12.6	60-80% of Useful Life Remaining 11.6
		80-100% of Useful Life Remaining 5.7	

Based on respondents’ comments, parts availability can be impacted by a variety of factors that make repair parts difficult to come by. OEMs can go out of business (and this situation was common post-COVID), companies may stop providing spare parts, repairs parts can become prohibitively expensive, and single-sourced repair parts can make procurement difficult, if not impossible. Moreover, the lead time for spares can be lengthy which can be caused by supply chain mismanagement, production delays, and the reliance on just-in-time inventory policies that can exacerbate these delays. Post-COVID lead times were also noted to be unreasonable.

Other reasons pertain to the economics of MROs that may result in assets being cheaper to replace than repair. Reasons behind this retirement situation may be a mixture of expensive and difficult to obtain spare parts, and equipment that is increasingly expensive to maintain and operate. Furthermore, assets may need to be retired before the end of life due to a lack of qualified maintenance personnel, or assets are simply wearing out from constant use.

Table 1: Respondent Comments on Reasons for Asset Retirement

Challenge Factor	Comments
<p>AVAILABILITY</p> 	<ul style="list-style-type: none"> ▪ OEM’s no longer in business prime reason ▪ Single-source, critical components from smaller vendors is an issue. ▪ Lack of spare parts was major reason for retiring equipment. ▪ Companies stop providing spares for older parts to push sales of newer versions. ▪ Sometimes, it is difficult to get spare parts, or are very expensive. ▪ In most cases we had a full machine shop and would fabricate a part if possible. ▪ No issues with spare part availability.
<p>LEAD TIME</p> 	<ul style="list-style-type: none"> ▪ Supply chain and logistics issues cause severe delays in part procurement and new equipment procurement. ▪ JIT is nowhere good enough anymore. Lost production / missed deliveries have been devastating. ▪ Some parts take too long to be manufactured. ▪ Lead time on spare parts post-COVID ridiculously unrealistic
<p>COSTS</p> 	<ul style="list-style-type: none"> ▪ Repair costs have escalated to a point where it is cheaper to replace. ▪ Cheaper to replace than repair. ▪ Very rarely is equipment retired due to lack of spare parts, generally, high costs. ▪ Cost is primary cause to retirement.
<p>ASSET OBSOLESCENCE / USEFUL LIFE</p> 	<ul style="list-style-type: none"> ▪ Qualified maintenance personnel not available for older model equipment ▪ Older machines were built more durable. ▪ Parts can only be replaced for so long before the entire machine is worn out. ▪ Obsolescence of parts was most common reason restricting an ROI for replacement.

CONCLUSIONS AND FOLLOW-ON STUDY

Survey results show that responding firms are undergoing the challenges of early asset retirement, with almost half of their major assets being retired before the end of useful life. And, MRO failures play an important role in this predicament. The lack of availability of spare parts, excessive lead times for spare parts, expensive cost of spare parts, and unavailability of skilled maintenance personnel are all factors contributing to the firms’ retiring their assets earlier than desired.

Since these MRO failures could have significant consequences for firms—including unpredictable uptime for key assets, increased inventory levels to cover for asset downtime, and decreased productivity—it is imperative that innovative MRO solutions be devised. To further explore potential approaches to mitigate MRO failures, the findings of this survey study help inform our follow-on study aimed to determine where additive manufacturing, or industrial 3D printing, may play a role in extending the useful lifecycle of critical assets, improving up-time, reducing waste, and saving both capital and operating costs. Stay tuned!



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About the Study Partners



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