

KIPPERTOOL®

Vendor-Managed Tool Systems

Reduce Turbine Outage Duration and Costs



Executive Summary

The expanding combustion turbine industry worldwide presents a market opportunity for turbine overhaul and repair organizations. These organizations, as well as generation companies/power producers, seek to minimize turbine outage duration and costs. A key component in this process is selection of the optimal tool systems. Effective vendor-managed tool systems can improve repair/overhaul personnel productivity, enhance workplace safety, help ensure regulatory compliance, support foreign material exclusion, and reduce outage duration and costs. This white paper describes the challenges associated with turbine maintenance, repair, and overhauls, and summarizes best practices for addressing these challenges using vendor-managed tool systems.

The Challenges of Turbine Maintenance, Repair, and Overhauls

The combustion turbine business is booming – both in the U.S. and worldwide. According to Forecast International, gas turbines will equip the majority of new power plants in the next decade. From 2012-2021, over 12,000 new gas turbines are forecasted to be installed [1].

The growing market for combustion turbines and steam turbines in U.S. and worldwide represents a significant market opportunity for organizations or teams that maintain, repair, and overhaul these machines. The annual costs to maintain, repair, and overhaul gas turbines are projected to double in the next ten years from about \$8 billion to \$16 billion [1]. For these organizations, operating productively and efficiently provides important competitive differentiation.

For owner/operators that conduct these activities using in-house crews (e.g., generation companies and power producers), this growth places pressure to enhance productivity and efficiency during outages, which can cost as high as \$1 million per day in lost generation revenues.

A key part of enhancing maintenance, repair, and overhaul productivity is the tool systems used for these activities. The challenges of turbine maintenance, repair, and overhauls related to tool systems encompass various different phases of these projects. These phases include:

- Project planning
- The beginning of the equipment maintenance outage
- The actual maintenance and repair work during the outage
- The end of the outage (see Figure 1).

In the project planning phase, maintenance and repair organizations contend with the complexity of working with multiple suppliers for needed tools and equipment. Large amounts of staff time are required for the tool and equipment procurement process. The use of multiple vendors also complicates compliance with tool safety regulations and ensuring of workplace safety (e.g., OSHA regulations, electrical codes, etc.). Periodic inspections, testing, and retooling of equipment such as chain hoists, chain pulleys, nylon rigging, wire rope, and others must be administrated across multiple suppliers. There are also complexities when using tools outside U.S. (e.g., conversion to 50 Hz, 220 volts). Each of these challenges is magnified when rapid ramp up of resources is needed to meet growing demand for repair services on specific projects.

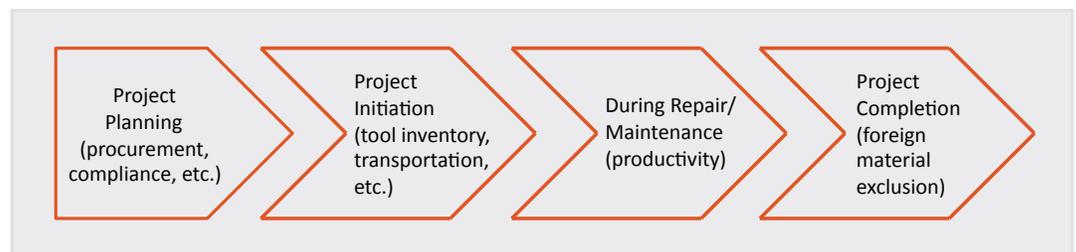


Figure 1. Tool Systems for Turbine Maintenance and Repair Affect All Project Phases

At the beginning of the project, tool inventory can be time consuming, as tools are often spread across multiple containers or storage locations and may not be organized. The large footprint of tools spread across multiple containers/bins may pose space constraint challenges, especially in legacy urban job sites. The high cost of transporting tools to job sites is also a consideration.

The tool system/solution should also be applicable to regulated utility environments. Because public utility commissions emphasize reliable service delivery at lowest reasonable cost, the solution should support those goals.

During the project, lack of tool organization and availability can lengthen equipment maintenance outages. Failure to identify the right tool at the right time can lead to costly delays.

At the end of the project, tool inventory can again be time consuming. Perhaps more importantly, lack of organization in tool inventory methods can complicate foreign material exclusion. The inability to reliably account for all tools upon project completion raises the possibility of inadvertent tool or other material inclusion inside rotating machinery. Upon machine startup, such material can damage or catastrophically destroy the machine, which obviously can lead to very expensive repairs. This can cost millions of dollars and may lead to possible litigation. The lack of an efficient inventory system can also lead to misplaced tools across various contractors. This lack of accountability and control of company tool assets can lead to ongoing tool costs.

Together, these challenges can potentially impair workforce productivity and increase maintenance outage time. Failure to ensure accountability and control of company assets can complicate foreign material exclusion, which can lead to very high costs in isolated cases. Failure to ensure compliance with regulations and ensure workplace safety can lead to potential regulatory fines and workforce accidents or injuries. As a whole, such adverse outcomes can degrade corporate image.

Best Practices: Comprehensive Vendor-Managed Tool Solution

The solution to these challenges is a tool system/solution from a single vendor. To address the challenges described above, such a system needs to be comprehensive (see Figure 2).

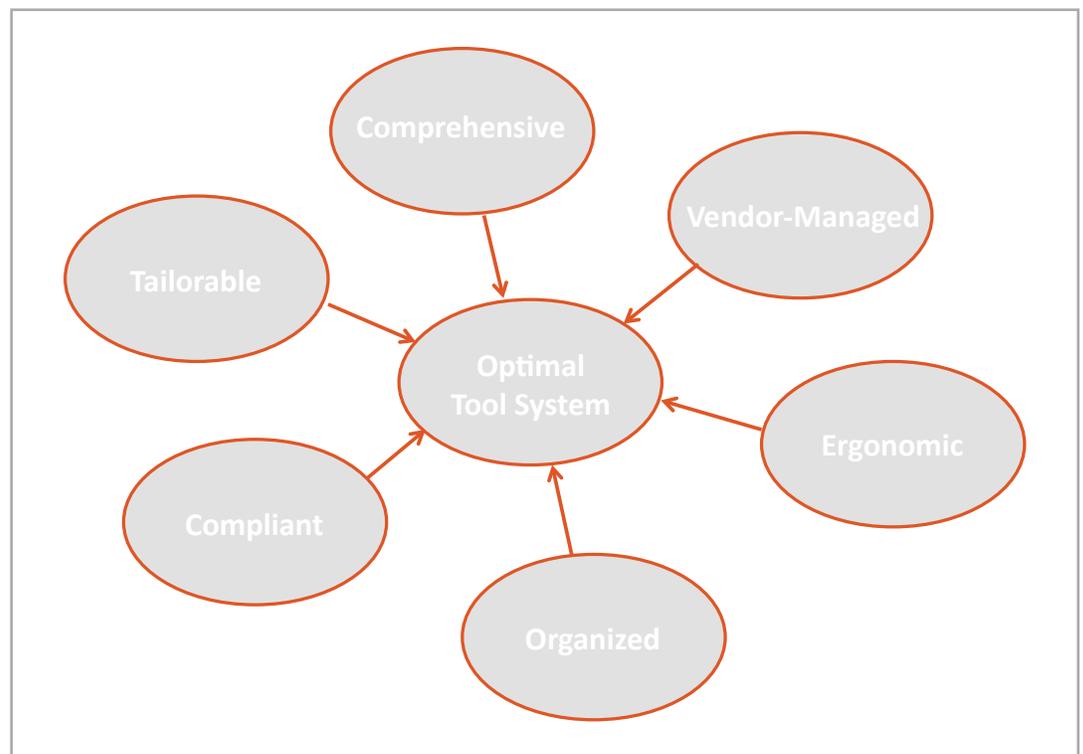


Figure 2. A Comprehensive Vendor-Managed Tool Solution includes Various Attributes

It should include all tools needed for specific jobs/machines. The tool system should be vendor-managed to ensure high productivity of the organization using it. The system must also be user friendly and ergonomic; it should be built to help ensure the safety and convenience of repair/overhaul crews (see Figure 3). The solution should be organized and laid out for rapid inventory and easily transportable due to this more efficient layout. This improved organization should also yield a smaller footprint. The vendor should handle all relevant regulatory compliance. The system should also be tailorable to domestic or international use and use seaworthy containers for international transport.

One of the best ways to organize tool systems uses a tool locator guide that includes part numbers, quantities, description, and warranty information (see Figure 4). Mylars provide an outline of each tool to facilitate return of each tool to its appropriate storage bin/drawer.

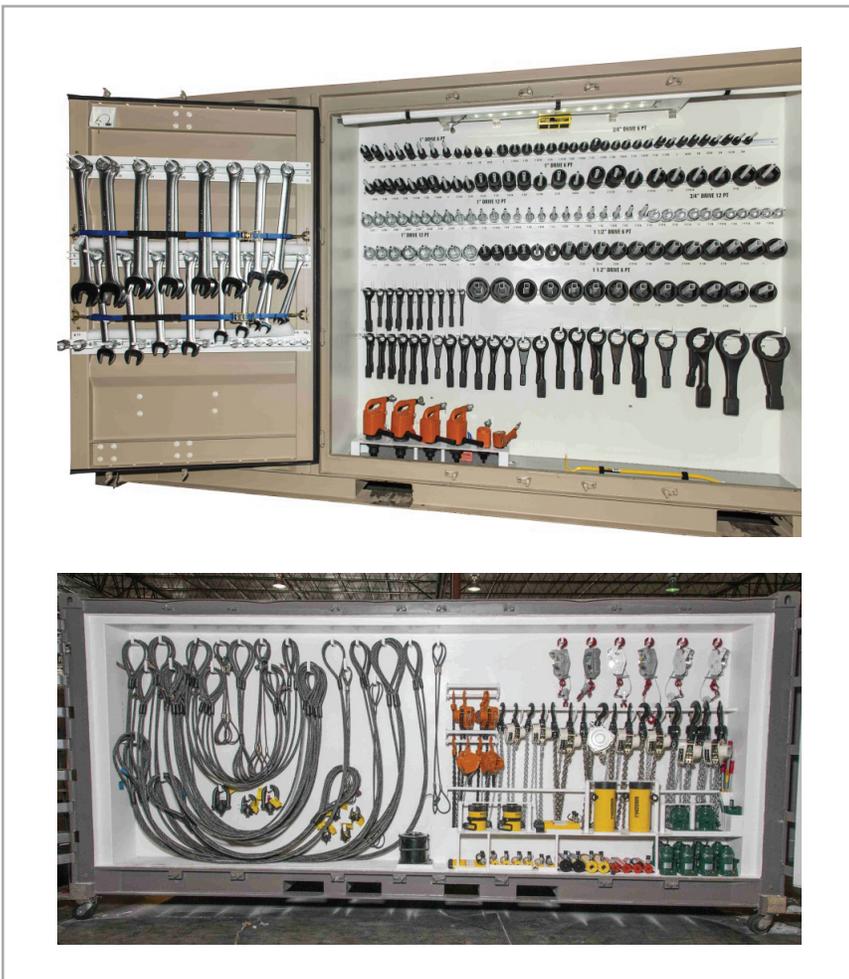


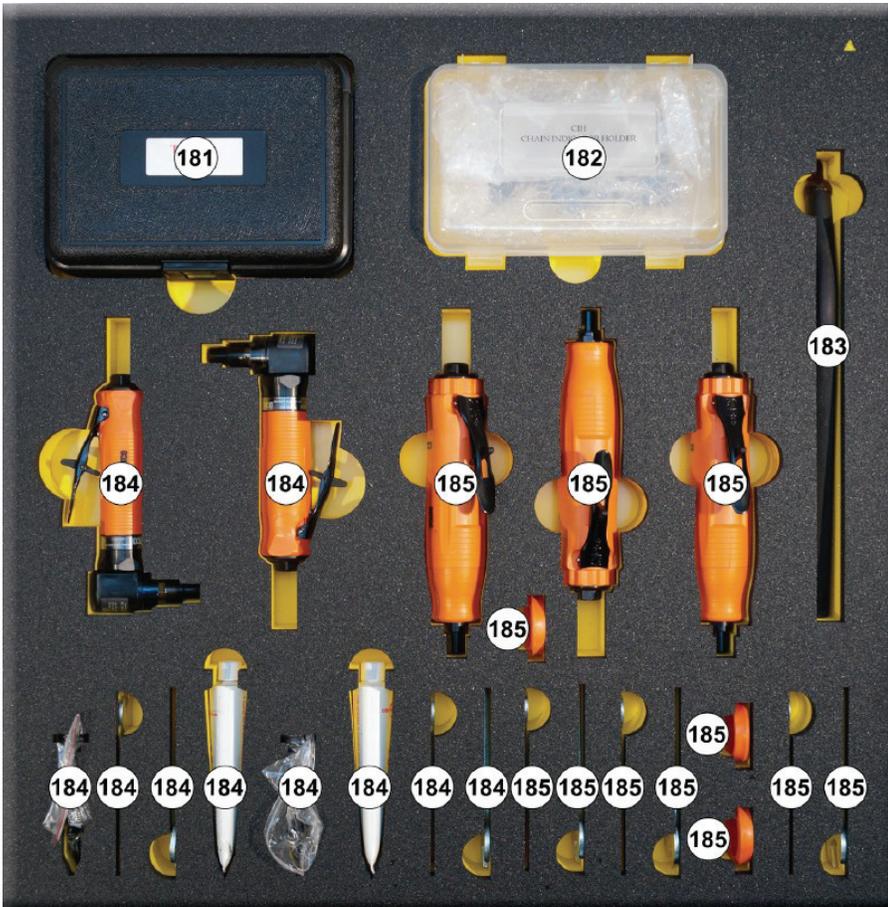
Figure 3. A tool system should be organized and ergonomic, like the layouts above. The top photo illustrates a slugging wrench impact closet for a steam turbine. The bottom photo illustrates rigging for a GE Frame 5/6 turbine.

All systems should be supplied with CNC routed color foam inserts to securely hold tools and provide easy inventory. As part of the solution, organized periodic testing, inspection, and repair/reconditioning of applicable tools is necessary to help ensure regulatory compliance and safety.

The solution should be applicable to generation companies or power producers that provide repairs and overhauls using in-house crews, as well as outage and repair organizations. The vendor should be able to apply its methodology to re-integrate *existing* tool systems or to deliver *new* turnkey tool systems.

The vendor should be able to provide a tool system/solution that is particularly tailored to each of the primary combustion turbine models, including GE Frame 5 & 6, GE Frame 7FA and 7EA, and GE Frame 9 gas turbines. Applicability should also extend to a variety of steam turbines from GE, Siemens, Alstom, and Westinghouse, as well as various generators and balance-of-plant equipment.

To aid tool asset control, the solution should offer the option to paint or laser etch company names/logos and MAP 2D barcode matrices on tools to avoid inadvertent tool loss.



DRAWER 11				
Loc.	Item ID	Description	Qty.	UOM
181	THX AS1	Air Scribe Percussion Tool	1	EA
182	POH CIH	Chain Indicator Holder	1	EA
183	POH PTS01	Packing Tooth Scraper	1	EA
184	CPT 12L1200-36	3" Right Angle Sander, 12,000 RPM	2	EA
185	CPT 12L2500-36	1/4" Pneumatic Die Grinder, 12,000 RPM	3	EA

Figure 4. A Tool Locator Guide Facilitates Return of Each Tool to its Appropriate Bin/Drawer

The Benefits of a Managed Tool System

Properly engineered and maintained tool systems enhance tool procurement productivity and enhance worker productivity during repairs and overhauls. The latter can reduce outage length and hence, reduce outage costs, improving the bottom line. Such tool systems can help rapidly ramp up new divisions or crews.

This approach also reduces the footprint of the tool system, enabling easier use, especially in space-constrained urban environments. Another byproduct of this approach is reduced tool system transportation costs.

Enhanced accountability and control of tools/assets helps ensure foreign material exclusion. This potentially avoids very large costs from machine catastrophic failure. Use of a single vendor for the tool system simplifies the process of ensuring regulatory compliance and enhancing workplace safety. Hence, the approach reduces both operating and regulatory risks, as well as enhances corporate image and reputation.



Kipper Tool Company provides tool systems that address all of the challenges, incorporate all of the solutions, and help users realize all of the benefits described in this white paper.

For More Information

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About Kipper Tool Company

Kipper Tool Company (KTC) provides tool systems that address all of the challenges, incorporate all of the solutions, and help users realize all of the benefits described in this white paper. The company is focused on identifying and providing the tool and equipment systems that each customer requires. KTC ensures the correct fit, form, and function of each tool and tool set it delivers. KTC's vendor managed tool systems are engineered and tested, modularized, standardized, cross-compatible, life cycle managed, and backed by a single world-wide warranty program.

KTC is an American Woman-Owned Small Business with a corporate office and warehouse facility in Gainesville, GA. Established in 1994, KTC is an authorized distributor for over 300 tool and industrial supply manufacturers. KTC is committed to providing industrial quality tools of all types to business, industry, and government agencies. KTC has been assisting the U.S. military transform and modernize to meet their critical requirements both domestically and overseas for almost 20 years. Today the core of KTC business, and the area in which we are most proud, is our support to the Soldiers, Sailors, Marines and Airmen of our United States Armed Forces.

Reference

1. Bill Schmalzer, Forecast International, "Gas Turbine Forecast," Trends in Power Generation are Detailed for 2013 and Beyond, including the Changing Role of the Gas Turbine," *Turbomachinery*, October 2012, volume 53, number 6, Handbook 2013, pp. 10-14, www.turbomachinery.com.