

Introduction

Tool adapter systems can remove waste from processes and boost profits. With such systems machine tool operators load cutting tools in cartridges that are loaded into a live toolstation chuck instead of loading the tool in the chuck. This makes tool changeovers quick, accurate, increases flexibility and can affect the 7+1 wastes of lean manufacturing.

Credit: <http://advancedmanufacturing.org/wp-content/uploads/2016/07/August-2016-AM-Now-Exsys.pdf>

1. Transport

Moving tools and toolholders between workstations and toolrooms drains resources. Typical preset live toolholders weigh 10–60 lb (4.5–27 kg), and many machines now have multiple stations and turrets. Tooling 36 stations on a turning center with three turrets with 15-lb (6.75-kg) toolholders requires moving 540 lb (243 kg). The adapter eliminates trips and lowers the weight being moved. Each adapter weighs about a pound (0.45 kg) and can be carried on a small cart. In our three-turret example, the operator now transports only 36 lb (16.2 kg)..

2. Inventory

Inventory, including WIP, must be stored, moved and sometimes packaged. Quicker changeover times made possible by adapter cartridges can improve work flow and reduce WIP by producing smaller lots sizes.

3. Motion

Hours are spent setting up fixtures, aligning toolholders and probing offsets. An adapter system can reduce downtime by cutting, combining and modifying steps. The first step in using a traditional ER collet system to set up a live tool is to clamp the tool either with or without a presetter. Not presetting the tool's length requires probing the offset and changing it in the parameters. Each time a toolholder is removed and then replaced in the same station it must be realigned to ensure it's repositioned within microns. Loading the tool and aligning the toolholder requires several hours for one 12-station turret, longer on a multiturret machine. Time is saved when adapters for the next job are preset offline while the current job is running and the live tools are left in the turret where they are already aligned..

4. Waiting

Waiting for replacement or repair of damaged tools can mean significant downtime. Buying a spare unit is often a good investment that lets production continue. Scheduling regular preventive maintenance can also eliminate unplanned downtime. Sometimes, though, it's easy to lose track of how many parts were made with a holder and how long it's been in service. Keeping the holders in the machine while changing adapters makes tracking live tool usage per machine easier.

5. Overproduction

Live toolholder adapter systems can support just-in-time (JIT) production by reducing lot size and setup times and balancing workstation capacity. Adapter systems enhance tooling flexibility and maximize the use of live tooling. Many manufacturers use an assortment of adapters to create a buffer to incorporate new jobs intermittently into an established production schedule, which can reduce WIP and create flexibility to meet customer demands.

6. Overprocessing

Some parts must go through a variety of machines to be completed. An adapter system can help eliminate or combine operations. Mill-turn machines easily manage turning and drilling processes, but require extra effort when milling. End mills usually have a Weldon Shank or a Whistle Notch style shank but use an ER collet for clamping. These shanks are designed to use a setscrew for greater clamping force and to avoid pulling or slipping of the end mill while cutting. Using a collet negates the need for the setscrew..

7. Defects

In JIT production where smaller lot sizes are made, the quality of each piece becomes more important, emphasizing the need for a high-quality adapter. Systems must provide adequate torque transfer, correct overhang, and be well-machined. High-quality adapters will deliver excellent repeatability and low runout, resulting in right-sized holes, slower tool wear, good surface finishes and aligned offsets when changing tools between jobs.

8. People

Underutilization of talented people is the unofficial eighth waste in lean. Use of a high-end adapter system makes the production process smarter, more efficient and allows human resources to be reallocated, creating an opportunity to cross train and discover new talents within employees.