



# TOOL LIFE EXPECTANCY

***HOW TO RECEIVE THE LARGEST RETURN  
FROM YOUR TOOLING INVESTMENT***

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NATOLI ENGINEERING COMPANY

## HOW LONG SHOULD A SET OF TOOLS LAST?

This is one of the most common questions asked of tooling vendors. The answer is dependent on many factors, including: tablet configuration, characteristics of the material being compressed, and steel type of the tooling. When evaluating the life of punches and dies, several steps can be taken to prolong and protect your investment.



## ***HOW TO RECEIVE THE LARGEST RETURN FROM A TOOLING INVESTMENT:***

### **MAINTAIN YOUR TABLET COMPRESSION TOOLING**

Tooling is a significant investment for companies. Individual punches and dies may represent a small portion of production costs in relation to the purchase and maintenance of the equipment, such as fluid bed dryers and tablet presses. However, over the life of a product, many sets of tooling will be necessary amounting to a sizable expenditure. Excessively worn or improperly maintained tools could create a tremendous liability to the production team by creating a perception of poor quality to the consumer. Tablet manufacturers will receive the most use and highest quality tablets from their tooling if the tools are properly maintained.



## 5 TOOLING MAINTENANCE TIPS FOR MAXIMUM RETURN ON YOUR INVESTMENT

### 1 **PROPER HANDLING AND STORAGE**

Proper handling and storage can be as simple as using tooling storage bins. These separate tools and keep them from striking one another. It's surprising just how many tools need to be replaced each year due to mishandling or "accidents" and how quickly that adds up. In some cases, tablet compression technicians simply lack a systematic handling procedure. Damage, such as nicks and dings on and around the punch tip, are commonly known to cause black specs and product discoloration as well as capping, lamination, and other visual defects.

Other solutions include racks and cabinets that provide adequate protection during storage and transport. The use of a desiccant pack inside the sealed tooling storage box or drawer is recommended as well.



## 2 **PROPER CLEANING**

A cleaning procedure with minimum human interaction is ideal to ensure that tools are cleaned consistently thus reducing potential for damage. Ultrasonic cleaning with an automatic dryer is the optimum procedure, as it provides the tooling with increased exposure to cleaning solution. Hard-to-reach portions of the punch, including keys and embossing, are cleaned without the risk of damage. The advantage of using a dryer in conjunction with an ultrasonic cleaner is that it eliminates the potential for surface corrosion and discoloration.



BEFORE

NATOLI ULTRASONIC CLEANER

AFTER



## 3 **PROPER MAINTENANCE**

Learning how to properly polish and refurbish punches is one of the surest and most inexpensive ways to maintain tablet quality and reduce operating costs. Maintaining the quality of your punches helps eliminate tablet defects such as picking, sticking, capping, and lamination while significantly reducing costs by increasing tool life.

Although there are several ways to polish and refurbish punches, the best method is to use a large unsewn cotton buff wheel. Restoring land is one of the most important procedures in tool refurbishing, and once a procedure is adopted, you will immediately recognize an increase in tooling life.

Polishing tools refurbishes the punch cups, restores land, and allows for minor repairs of punch heads, back angles, and barrels. Manufacturers using the cotton wheel method often double the usable life of the punch – increasing the life of your investment. However, polishing done by an inexperienced technician could destroy a set of tools. Great care should be taken that only a small amount of material is removed during this process. Polishing is a form of controlled wear; unnecessary refurbishment can adversely affect the life of the tooling. Therefore, a well-trained and experienced tooling technician should complete this maintenance procedure.

## WEAR CAUSES J-HOOK

Over time punches and other compression tools lose their luster and develop nicks, scratches, and/or J-hook. The most common tableting defect is a result of J-hook. Wear from abrasive products and even the smallest contact between the upper punch tip and the die during entry can create J-hook on punches.

When the land erodes, the upper punch is very susceptible to the formation of J-hook. However, J-hooks can form on both the upper and lower tips if the conditions are right. Inspection of upper and lower punch tips is essential.

Tooling wear and J-hook can result from worn punch guides. The same type of wear also can be the result of improper die installation. Tools such as die driving rods, a die insertion tool, and preset torque wrenches are all great instruments to help ensure proper die installation and to help prevent die pocket wear, which will increase tool life and maintain tablet quality.

A manufacturer whose SOPs require routine cleaning, inspection, repair, lubrication, and the careful handling and storage of punches will discover that these maintenance practices are an inexpensive way to ensure the consistent production of high-quality tablets and thus improve the company's bottom-line.

### **REGULAR TOOL MAINTENANCE CAN:**

- » **Increase the life of your tools by as much as 80 percent**
- » **Eliminate need for press downtime to repair or replace punches**
- » **Reduce tooling and operating costs**
- » **Minimize the manufacture of defective tablets**

**A PROPER MAINTENANCE PROGRAM IS INTEGRAL TO PRODUCING HIGH-QUALITY TABLETS EFFICIENTLY.**



*Typically, the first area of the punch to wear is the land, the flat and narrow area at the tip's perimeter. With wear, the tip becomes very thin and is more susceptible to damage.*





## 4 **PROPER LUBRICATION**

**AUTOMATIC LUBRICATION SYSTEMS CAN PROVIDE FALSE ASSURANCE THAT APPROPRIATE LUBRICATION IS BEING SUPPLIED TO ALL THE NECESSARY AREAS OF THE PUNCHES.**

By simply applying a food-grade barrel lubricant to the punch barrel and applying a food-grade grease to the head of the punch with a proper brush prior to set-up and operation, you will ensure proper lubrication on tablet press start-up. Some auto-lubrication systems require the lubricant to migrate into distribution channels requiring centrifugal force. Automatic lubrication may not have reached critical lubrication points at press start-up, which can lead to damage on mating parts of the punch, including guides, keyways, cams, and pressure rollers as well as premature wear to the tools themselves.

If a tool is not properly lubricated, it will cause excessive friction, increasing the operating temperature of the punch. The result is a thermal expansion of the punch barrel, which reduces the space allowed for lubrication. This expansion can lead to emergency stops, tool binding, and tool damage.

## EXTENDING TOOL LIFE BEYOND PROACTIVE MEASURES

### 5 RESIZING TOOL LENGTHS

The working length of the tool is critical in production, as it ensures consistent tablet parameters are met throughout the set. Punches should be visually inspected and measured before being transferred into storage. Working lengths of the set should be within the tolerance range determined by internal SOPs.

In most cases, tools that are out of specification with working length can be lightly machined and put back into specification. If the working length is out of spec, contact your tooling supplier to discuss difference troubleshooting options. Management constantly evaluates cost reduction strategies, and those decisions reverberate through the business. It's the responsibility of the production team and procurement department to reduce variable costs while maintaining or increasing output and efficiency. It's the responsibility of all those involved, including suppliers, to ensure that costs are minimal and outputs are maximized. Protecting the company's investment by properly maintaining tooling can be a part of cost reduction.



*By maintaining the integrity of your tools through proper lubrication, handling, storage, and maintenance, production can ensure consistent and efficient tablet manufacturing while prolonging tool life and tablet quality.*