HAZARDS AND MITIGATIONS
FOR EVERDAY SHOP TOOLS

THIS EBOOK CONTAINS MULTIPLE SECTIONS. JUMP TO THE SECTIONS YOU WANT BY CLICKING THE ICONS BELOW.

UNDERSTANDING THE PROBLEM
(ARTICLES AND REFERENCES)

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MISCONCEPTIONS

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(ADDRESS THE PROBLEMS ABOVE WITH THIS SIMPLE AND EFFECTIVE SAFEGUARD)

PRODUCT DEMOS

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THIS EBOOK IS SPONSORED BY:

MAKESAFE® TOOLS
PREVENTING INJURIES SINCE 2016

DESIGNED AND MADE IN THE USA

In november of 2016, founder and CEO Scott Swaaley had an idea and founded MAKESAFE Tools. Makesafe tools is now a leader in power tool safety, has two pending patents, and is working with the national institute of occupational safety and health to develop even more advanced technologies to keep machine operators safe.

OUR FLAGSHIP PRODUCT IS THE MAKESAFE POWER TOOL BRAKE

- Stops hazardous tool coasting
- Prevents accidental restarts
- Adds compliant e-stop
- Restricts unauthorized acess
- Avoids injuries & fines
- Installs in 2 minutes

The MAKESafe Power Tool Brake

INTRODUCTION

Safety professionals spend their days working to balance three primary company goals - injury prevention, compliance, and profitability. When these competing factors cause conflict within an organization, the onus is on the safety professional to identify hazards, research standards and best practices, and ultimately recommend mitigations.

"...THREE PRIMARY COMPANY GOALS - INJURY PREVENTION, COMPLIANCE, AND PROFITABILITY."

With the ever-increasing breadth of EHS responsibilities and an industry tendency towards reactive policy, it's important to not lose sight of the everyday hazards present in nearly every facility. This eBook takes a look at one such group of hazards - the hazards of stationary power tools and plug-in industrial machinery under 5HP. These hazards fall under the umbrella of "machine safeguarding" yet represent a side of the practice not typically understood or discussed in industry. To better understand these hazards we will take a look at injury profile data, identify common causes of injury, look at applicable standards, then recommend some mitigations.

The Power Tool Brake installed on a 1.5HP bandsaw with door interlocks.

PRODUCT DEMOS

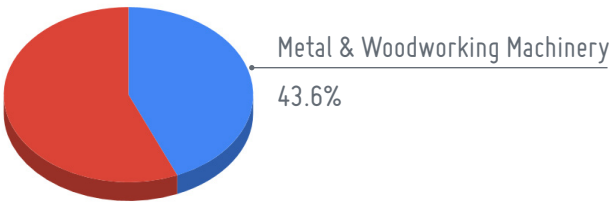
CLICK HERE TO RETURN TO THE MAIN MENU

INJURY PROFILE DATA

"37,000 INJURIES OCCUR ANNUALLY AS A RESULT OF WORKERS BEING CAUGHT IN, STRUCK BY, OR STRUCK AGAINST MACHINERY"

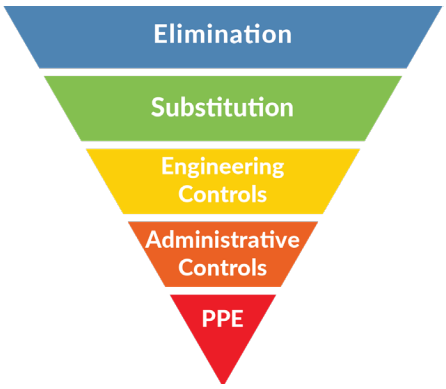
The Bureau of Labor Statistics catalogs occupational injuries, illnesses, and fatalities (IIF) profiles across all US industries. If we filter this data to look specifically at injuries caused by machinery we find that over 37,000 injuries occur annually as a result of workers being caught in, struck by, or struck against machinery.

It's easy to assume that the bulk of these injuries are a result of huge industrial machinery but the data paints a different picture. More than 43% of classified machinery incidents are a result of standard metal and woodworking machinery.



The worst offenders are grinding and polishing equipment, followed closely by metal forming equipment, mills and drills, and saws. These everyday shop tools - the bandsaws, bench grinders, and drill presses of the world - represent hazards just as significant as their industrial counterparts. While shields and PPE are important parts of any machine guarding strategy, we know from OSHA's Hierarchy of Controls that PPE is the least effective means of mitigation.

HIERARCHY OF CONTROLS



To understand why, we need to learn more about when these injuries are occurring. The IIF data reports that only 45% of these machinery-related injuries occur during the regular operation of a machine. The remaining 55% of injuries occur during machine maintenance and cleaning, as a result of being struck against a moving part of machinery, or in a myriad of other situations that the injury profiles are not able to classify.

Based on decades of experience in shops, in-depth interviews with safety professionals, and a detailed review of hundreds of OSHA incident reports, we have found four general hazard categories that help to account for the 55% of injuries that occur outside of the normal operation of a machine.

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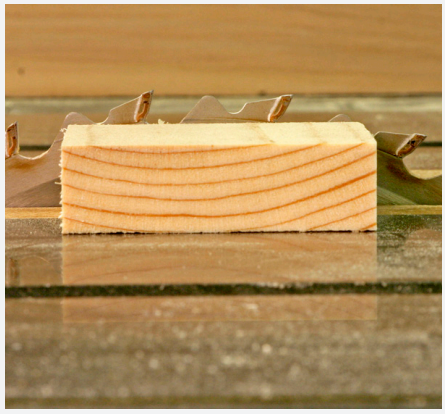
THE BIG THREE HAZARDS

1. ACCIDENTAL RESTARTS & HAZARDOUS ENERGY

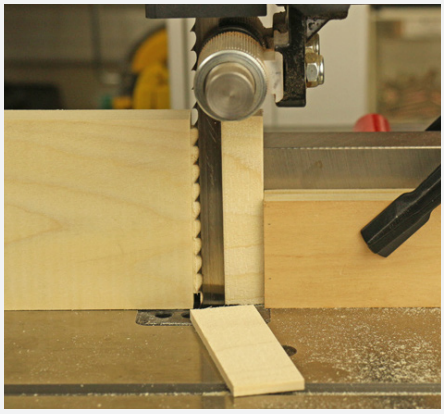
Automatic and unintentional restarts happen when power is lost while a machine is operating. The machine then starts itself when power is restored. This is a specialized case of hazardous energy control but one that is not solved with typical lockout tagout procedures. That is why OSHA, ANSI, NFPA, NEC, and CSA all explicitly require means to prevent unintentional restarting of machinery.

2. COASTING TOOLS

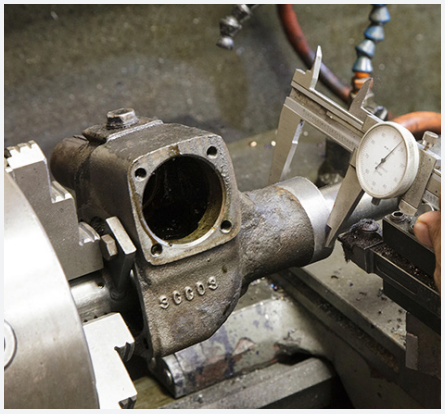
Most power tools have significant inertial mass that keeps them operating, sometimes silently, for as long as two minutes after power has been removed. You wouldn't leave a tool operating unattended, yet that is exactly what happens every time an operator walks away from a coasting tool. These coasting tools can cause injury to an operator as they reach to remove or measure a workpiece after an operation, when a passerby comes into accidental contact with the tool, or when another operator begins setup on a new operation.



A typical table saw operation that may require displacement of the blade guard in order to retrieve a bit of material.



A typical band saw operation that requires an operator to retrieve the material while the machine may still be coasting.



A typical lathe operation that requires an operator to reach near a part while it may still be rotating from it's inertia.

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THE BIG THREE HAZARDS (CONT'D)

3. EMERGENCY SITUATIONS

In an emergency situation, a machine operators ability to avoid a hazard can be significantly effected by:

- **ACCESSIBILITY.** If the off button or switch isn't easy to find, easy to access, and easy to actuate in a compromised situation, then it isn't going to be effective in an emergency.
- **MITIGATION EFFECT.** Common emergency stop buttons simply remove electrical power from the system (a "Category 0" stop). However, most machinery will still have mechanical energy in the form of inertia so the continued movement of the machinery will continue to exacerbate an emergency situation until it naturally machinery comes to rest. In contrast, a "Category 1" emergency stop provides a controlled stop when activated and may significantly lessen the severity of an injury.

QUICK TIP

OSHA maintains a visual and interactive catalog of machine guarding requirements for specific machines. The catalog is not exhaustive but it can be a great starting point when evaluating machinery hazards. The service is called eTool is available at the link below.

Click Here for OSHA eTool

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COMPLIANCE

OSHA STANDARDS

General Requirements for All Machines [OSHA 1910.212(a)(1)]

"One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks."

"[The guarding device] shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle"

"Other employees" includes all employees that may be in the proximity of a machine while a hazard is present.

"Operating cycle" includes all recurring and likely states of operation, many of which are outside normal operation of the machine.

It can be hard to stay abreast of all safety standards and expectations. There are ANSI and OSHA requirements to comply with and then there is an ever-changing body of institutional knowledge that defines general best practices and code interpretations.

A good place to start with any machine risk assessment is with OSHA's general requirements for machines, an excerpt of which is provided above. This standard requires that consideration be given to the entire operating cycle, which includes times other than the regular operation of the machine. This includes setup that takes place before an operation, cleanup or post-processing that takes place after an operation, as well as jams, malfunctions, power loss, maintenance and the myriad of other conditions in which operators an employees may find themselves near a machine. This expanded definition make sense when viewed in light of the injury profile data provided above and adherence to this standard can prevent injuries resulting from a failure to control hazardous energy, automatic and unintentional restarting, coasting tools, and emergency situations. Any risk assessment should therefore define the operating cycle and work to include these additional considerations in the assessment.

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COMMON MISCONCEPTIONS

Safety professionals should always perform a risk assessment to evaluate their specific machinery and context before proceeding with any mitigations. However, there are significant commonalities across use cases for standard stationary power tools like band saws, grinding and polishing machinery, and milling and drilling equipment. As you evaluate hazards and mitigations on this type of equipment, be ready to address the following misunderstandings:

NEW TOOL ≠ COMPLIANT TOOL.

Most brand new tools, even those from reputable companies, are non-compliant out of the box. It is not a manufacturer's legal responsibility to protect operators - it's yours!

INEXPENSIVE TOOL ≠ INEXPENSIVE HAZARD

Many companies struggle to justify spending hundreds of dollars on safeguards for a bench grinder that cost less than $200 yet an injury or fatality resulting from a $200 bench grinder has the same human and financial cost as one caused by a $2,000,000 press.

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MAKESAFE PRODUCT DEMOS

The following demos are external links to youTube videos. Click them to watch the video in your browser.

PRODUCT DEMO #1

See a brief explanation of our power tool brake as a comparison beteen two bench grinder. Presented by Founder & CEO Scott Swaaley at the 2019 National Safety Congress and Expo.

PRODUCT DEMO #2

See a brief explanation of our power tool brake installed on a bandsaw with (optional) interlocks. Presented by Founder & CEO Scott Swaaley at the 2019 National Safety Congress and Expo.

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MAKESAFE PRODUCT SPECS

	PTB-V120-P1	PTB-V240-P1	PTB-V240-P3
Rated Input Voltage	120 VAC 1 PH, 60 Hz (50 Hz options available)	240 VAC 1 PH, 60 Hz (50 Hz options available)	240 VAC 3 PH, 60 Hz (50 Hz options available)
Rated Horsepower (UL508)	1.5 HP	3.0 HP	5.0 HP
Rated Current (UL508)	15A	15A	15A
Approvals	UL508: Industrial Control Devices CSA #14-13: Industrial Control Equipment LISTING NUMBER: E114885		(expected Q1 2020)
Dimensions (main enclosure only)	7.25" L x 5.0" W x 2.3" H (185 mm x 127 mm x 57 mm)		
Dimensions (std. control panel)	3.0" x 2.0" x 0.9" in. (76.20 mm x 50.80 mm x 22.86 mm)		
Weight (main enclosure)	3 lbs (1.4 kg)		3.3 lbs (1.5 kg)
Rated Output Voltage (normal operation)	120 VAC	240 VAC	
Rated Output Voltage (during braking)	15 - 90 VDC	30 - 180 VDC	30 - 240 VDC
Standard Connector Type	NEMA 5-15 (custom and international options available)	NEMA 6-15 (custom and international options available)	NEMA L15-20 (custom and international options available)

Notes:
1. This device is only compatible with direct-powered induction motor tools. To verify compatibility, see compatability guide in product manual, available at www.makesafetools.com.
2. Suitable for connection in the field to a branch circuit rated not more than 20 amperes and capable of delivering not more than 5,000 rms symmetrical amperes

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CONTROLLING YOUR BRAKE

STANDARD

Each of our power tool brakes comes with a standard control panel. This control panel contains a start button and a latching emergency stop button. The control panel connects to the brake with a two meter long cord and is terminated by an M12 industrial connector, making connection simple.

CUSTOM CONTROLS

The Power Tool Brake is easy to customize. Custom controls can be made in the factory and shipped with the product or user-configured in the field using off-the-shelf parts. Custom control configurations include:

- Door & Shield Interlocks
- Access Control (key switch, RFID, etc.)
- Multiple E-Stops
- Automation

FOOT SWITCH

The Power Tool Brake can be easily configured to operate via a foot switch with the functions listed below. This allows operators to use equipment hands-free and ensures that the machine is always stopped when an operation is completed.

- Depress pedal to operate machine.
- Release pedal to brake and power-off machine.

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PURCHASE & INSTALLATION

PURCHASING

1. Proceed to www.makesafetools.com and navigate to the ORDER tab.
2. Submit the order form to receive a quote within 24 hours.
3. Once your quote is approved, you can pay via credit card or apply for credit and issue a Purchase Order.

CLICK HERE TO VISIT OUR ORDER PAGE

INSTALLATION

Installation is simple and typically takes less than five minutes. Detailed instructions can be found in the product manual at www.makesafetools.com. The basic steps are:

1. Plug your machine into the power tool brake.
2. Plug the power tool brake into a standard wall outlet.
3. Mount your control panel.
4. Calibrate the power tool brake.
5. Get back to work.

CLICK HERE TO REVIEW OUR INSTALLATION MANUALS

CLICK HERE TO VISIT OUR WEBSITE