

## Drill Maintenance eLearning Course Catalog

Maintaining a skilled, knowledgeable workforce is a challenge everyone faces. With changing technologies and fluctuations within the mining industry, it can be especially daunting. Whether you need training for a new hire or a veteran, it can be difficult to find training that is engaging, technologically relevant and easy to fit into busy schedules. Product Training and Publications, the technical communication and training group within P&H Mining Equipment, strives to provide you with the knowledge, skills and competencies needed for your employees to achieve their highest performance potential.

Product Training and Publications has identified eLearning as the primary delivery method for the knowledge components of Fundamental and Product Specific Training. eLearning provides several advantages over traditional training methods:

- eLearning content can be accessed on any computer that has Internet access by any individual who has the appropriate login and password credentials.
- Immediate availability of training content. Students receive the training they require right now, when the training is required most. This provides a quicker, more productive workforce.
- Reduces the cost of training by eliminating travel, living, and other expenses associated with Instructor Led Training.
- Provides students with the ability to learn at their own pace and in their own comfortable environment.
- Improved retention of technical and operational content.
- The training content can be delivered to a large contingent of people in varying locations and be technically consistent across the board.
- Training content can be tailored to an individual's personal strengths and weaknesses. This provides a targeted more effective training solution for today's workforce.
- When used as a prerequisite to Instructor Led Training, eLearning can level the playing field between novice and senior personal. This makes the Instructor Led Training more effective by allowing the Instructor to spend more time developing skills rather than knowledge-based components.

This Course Catalog contains descriptions of the eLearning Lessons available to you through Product Training and Publications.

### **Lesson Duration:**

Each eLearning Lesson is designed to be 15 - 45 minutes in duration. However, because eLearning is self-paced training, actual duration may vary per student.

### **Target Audience:**

Drill Operators, Technicians, and Engineers who will operate and/or perform maintenance on P&H and Komatsu Mining Drills.

### **Prerequisites:**

Students should have a basic working knowledge of computers, and fundamental understanding of electronics, mechanics, pneumatics, hydraulics, operation, etc., as it applies to the systems of a P&H or Komatsu Blasthole Drill.

### **Lesson Location:**

eLearning content can be accessed on any computer that has Internet access by any individual who has the appropriate login and password credentials.

### **Computer Requirements:**

It is recommended that all computers accessing eLearning content have the basic minimum requirements:

- Internet Explorer version 7 or better.
- Java version 1.5 or better.
- Latest version of Windows Media Player.
- Adobe Reader version 8 or better.



# Drill Maintenance eLearning Course Catalog

## Drill Maintenance Curriculum

### 77 Class of Drills Maintenance Standard Curriculum

Lesson 3.9	Product Overview ( <a href="#">Reference the General eLearning Course Catalog</a> )
Lesson 4.5	Power Module
Lesson 5.5	Hydraulics System
Lesson 6.5	Propel System
Lesson 7.5	Main Air and Water Injection Systems
Lesson 8.5	Mast Assembly
Lesson 9.5	Rotary and Pulldown Systems
Lesson 10.5	Pipe and Bit Handling System
Lesson 11.5	Electrical Control System
Lesson 12.5	Operator Cab Controls

### 320XPC Maintenance Standard Curriculum

Lesson 3.8	320XPC Product Overview ( <a href="#">Reference the General eLearning Course Catalog</a> )
Lesson 4.2	320XPC Power Unit
Lesson 5.2	320XPC Hydraulics
Lesson 6.2	320XPC Propel System
Lesson 7.2	320XPC Main Air System
Lesson 8.2	320XPC Water Injection System
Lesson 9.2	320XPC Mast Assembly
Lesson 10.2	320XPC Rotary Carriage
Lesson 11.2	320XPC Pipe Handling System
Lesson 12.2	320XPC Leveling System
Lesson 13.2	320XPC Auto Lubrication System
Lesson 14.2	320XPC Electrical System

## Drill Maintenance Lesson Descriptions

### 77 Drill Class Standard Maintenance Curriculum

#### Lesson 4.5 Power Module

**Lesson Description:**

In this lesson you will be given a basic understanding of the Power Module. Descriptions and locations of the various components will be provided to give a better understanding of how this system operates. While reviewing this lesson, it is important to be aware of the various components of the power module and to familiarize yourself with the locations of the components.

**Objectives:**

Upon completion of this Lesson the student will:

- Identify and locate the Power Module and its components
- Understand the Power Module and its functions

**Lesson Outline:**

- Lesson 1 Power Module Overview
- Lesson 2 System Components

#### Lesson 5.5 Hydraulics System

**Lesson Description:**

This lesson will provide you with the information necessary to gain an understanding of the purpose, operation, and components of the Hydraulic System. The hydraulic system lesson is important to review to understand what the main components of the system are and how the components operate. The hydraulic system is a very important part of the drills operation so understanding the operation and the components of the hydraulics will be helping in maintaining the drill and in proper operation.

**Objectives:**

Upon completion of this Lesson the student will:

- Describe the purpose of the Hydraulics
- Identify the shared components
- Describe the functionality of the Main Hydraulic System
- Describe the functionality of the Auxiliary Hydraulics System
- Describe the functionality of the Fan Drive Hydraulics
- Describe the functionality of the Recirculation Hydraulics

**Lesson Outline:**

- Topic 1 Introduction
- Topic 2 Shared Components
- Topic 3 Main Hydraulic Operation
- Topic 4 Auxiliary Hydraulic Operation
- Topic 5 Fan Drive Hydraulics
- Topic 6 Recirculation Hydraulics

## Lesson 6.5 Propel System

### Lesson Description:

In this lesson you will know how the 77 class of drills propels in the different available directions of movement. You will also see a brief overview of the components that create the Propel System. While reviewing this lesson, having a general understanding of the main components of the system and how they operate will enhance your knowledge for this class of drill.

### Objectives:

Upon completion of this Lesson the student will:

- Understand how the propel system functions
- Identify the main components of the Propel System
- Describe and identify the main components of the Propel Motors and Propel Transmissions

### Lesson Outline:

- Topic 1 Propel System Overview
- Topic 2 Propel System Components

## Lesson 7.5 Main Air and Water Injection Systems

### Lesson Description:

This lesson will provide you with the information necessary to gain an understanding of the purpose, operation, and components of the Main Air. While reviewing this lesson, it is important to be aware of the various components of the main air and to familiarize yourself with the locations of the components.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Main Air System
- Identify the components of the Main Air System
- Describe the functionality of the Main Air System

### Lesson Outline:

- Topic 1 Main Air Major Component Locations
- Topic 2 Main Air Major Components-Power Skid
- Topic 3 Main Air Major Components-Deck
- Topic 4 Main Air Major Components-Mast
- Topic 5 Main Air Major Components-Rotary Carriage
- Topic 6 Water Injection System

## Lesson 8.5 Mast Assembly

### Lesson Description:

This lesson will provide you with the information necessary to gain an understanding of the purpose, operation, and components of the Mast. The Mast Lesson is important to review to understand what the main components of the system are and how the components operate. The mast is a very important part of the drills operation so understanding the operation and the components of the mast will be helping in maintaining the drill and in proper operation.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Mast
- Identify the main components of the Mast
- Describe the functionality of the Mast Components

### Lesson Outline:

- Topic 1 Mast Introduction
- Topic 2 Mast Components
- Topic 3 Mast Maintenance

## Lesson 9.5 Rotary and Pulldown Systems

### Lesson Description:

This lesson provides information on the purpose, operation and components of the Rotary Carriage Equipment. It's very important to review this section to understand the main components of the system, and how the components operate. The rotary carriage equipment is an important part of the drills operation so maintaining this equipment will be very important to the life of the parts as well as keeping the drill working at all times.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Rotary and Pulldown Systems
- Identify the main components of the Rotary and Pulldown Systems
- Understand the operation of the Rotary and Pulldown Systems

### Lesson Outline:

- Topic 1 Introduction and operation of the Rotary and Pulldown Systems
- Topic 2 System Components

## Lesson 10.5 Pipe and Bit Handling Equipment

### Lesson Description:

In this lesson you will see a brief overview of each of the major systems the Pipe and Bit Handling Equipment. At the end of this lesson you will understand each system and the main functionality of each system.

### Objectives:

Upon completion of this Lesson the student will:

- Have a brief understanding of the Pipe and Bit Handling Equipment
- Be able to identify the system components
- Have a brief understanding of the system that makes up the Pipe and Bit Handling Equipment

### Lesson Outline:

- Topic 1 System Overview
- Topic 2 System Components
- Topic 3 Theory of Operation

## Lesson 11.5 Electrical Control System

### Lesson Description:

In this lesson you will be given a basic understanding of the Control System. Descriptions and locations of the various components will be provided to give a better understanding of how this system operates. While reviewing this lesson, it is important to be aware of the various components of the electrical system and to familiarize yourself with how they work together.

### Objectives:

Upon completion of this Lesson the student will:

- Identify and locate the electrical components
- Understand how the electrical control system functions

### Lesson Outline:

- Topic 1 Introduction to Control System
- Topic 2 CAN Bus Network
- Topic 3 CAN Bus Machine Components
- Topic 4 Operator Cab Components
- Topic 5 Deck Mounted Components
- Topic 6 Safety/Maintenance

## Lesson 12.5 Operator Cab Controls

### Lesson Description:

In this lesson you will see a brief walk through of the Operator's Cab and controls available to operate the ZR77 Blasthole Drill. At the end of this lesson you will have an understanding of the general cab layout, the left-hand and right-hand joysticks, as well as the keypad controls.

### Objectives:

Upon completion of this Lesson the student will:

- Have a brief understanding of the ZR77 Operator Cab Controls
- Be able to identify the major controls available to the operator while sitting in the operator's seat
- Have a brief understanding of the functionality of the left-hand and right-hand joysticks

### Lesson Outline:

- Topic 1 Operator's Cab
- Topic 2 Operator's Controls
- Topic 3 Operator's Movement Controls
- Topic 4 Operator's Panel
- Topic 5 Operator's Touch Screen

## 320XPC Standard Maintenance Curriculum

### Lesson 4.2 320XPC Power Unit

**Lesson Description:**

This Lesson will provide a base knowledge of the new 320XPC Drills Power Unit. Descriptions and locations of the various components will be provided to give a better understanding of the Drills new system.

**Objectives:**

Upon completion of this Lesson the student will:

- Identify and locate the Power Unit and its components.
- Understand the Power Unit and its functions.

**Lesson Outline:**

- Topic 1 Power Unit
- Topic 2 Main Motor
- Topic 3 Pump Drive Transmission

### Lesson 5.2 320XPC Hydraulics

**Lesson Description:**

This Lesson will take you through the hydraulic system for the 320XPC Blasthole Drill. The Lesson breaks the hydraulic system down to help you understand each section of the system including, Propel Hydraulics and Auxiliary Hydraulics.

**Objectives:**

Upon completion of this Lesson the student will:

- Understand the main hydraulic system and its components.
- Understand the auxiliary hydraulic system and its components.
- Know where all components are location on the Drill.
- Have a complete understanding of how this system works in a whole.

**Lesson Outline:**

- Topic 1 Hydraulic System Overview
- Topic 2 Hydraulic System Components
- Topic 3 Main Hydraulic Operation
- Topic 4 Auxiliary Hydraulic Operation



## Lesson 6.2 320XPC Propel System

### Lesson Description:

This Lesson provides information on the purpose, operation and components of the propel system used on the 320XPC Drills.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Propel System.
- Identify the main components of the Propel System.
- Describe the purpose of the Propel Motor.
- Identify the main components of the Propel Motor.
- Describe the purpose of the Propel Transmission.
- Identify the main components of the Propel Transmission.

### Lesson Outline:

- Topic 1 Propel System Overview
- Topic 2 Propel System Components
- Topic 3 Propel Motor
- Topic 4 Propel Transmission

## Lesson 7.2 320XPC Main Air System

### Lesson Description:

This Lesson provides information on the purpose, operation and components of the Main Air System on the 320XPC Blasthole Drill.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Main Air System.
- Identify the components of the Main Air System.
- Understand the operation of the Main Air System.

### Lesson Outline:

- Topic 1 Main Air Overview
- Topic 2 System Components

## Lesson 8.2 320XPC Water Injection System

### Lesson Description:

This Lesson provides information on the purpose, operation and components of the Water Injection System.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Water Injection System.
- Identify the main components of the Water Injection System.
- Describe the purpose of the Water Tank.
- Identify the main components of the Water Tank.
- Describe the purpose of the Water Pump.
- Identify the main components of the Water Pump.
- Describe the purpose of the Water Control Assemblies.
- Identify the main components of the Water Control Assemblies.

### Lesson Outline:

- Topic 1 Water Injection Overview
- Topic 2 Water Tank
- Topic 3 Water Pump
- Topic 4 Control Components

## Lesson 9.2 320XPC Mast Assembly

### Lesson Description:

This Lesson provides information on the purpose, operation and components of the Mast Assembly.

### Objectives:

Upon completion of this Lesson the student will:

- Describe the purpose of the Mast Assembly.
- Identify the main components of the Mast Assembly.
- Describe the purpose of the Back Braces.
- Identify the components of the Back Braces.
- Describe the purpose of the Anchor Pins.
- Identify the main components of the Anchor Pins.
- Describe the purpose of the Mast Cylinders.
- Identify the components of the Mast Cylinders.
- Describe the purpose of the Auxiliary Winch.
- Identify the components of the Auxiliary Winch.

**Lesson Outline:**

- Topic 1 Mast Overview
- Topic 2 Back Braces
- Topic 3 Anchor Pins
- Topic 4 Mast Cylinders
- Topic 5 Auxiliary Winch

## Lesson 10.2 320XPC Rotary Carriage

**Lesson Description:**

This Lesson provides information on the purpose, operation and components of the Rotary Carriage Equipment for 320XPC Blasthole Drills.

**Objectives:**

Upon completion of this Lesson the student will:

- Describe the purpose of the Rotary Carriage Assemblies.
- Identify the main components of the Rotary Carriage Assemblies.
- Describe the purpose of the Pulldown Machinery.
- Identify the main components of the Pulldown Machinery.
- Describe the purpose of the Rotary Machinery.
- Identify the main components of the Rotary Machinery.

**Lesson Outline:**

- Topic 1 Rotary Carriage Overview
- Topic 2 Pulldown / Hoist Machinery
- Topic 3 Rotary Machinery

## Lesson 11.2 320XPC Pipe Handling System

**Lesson Description:**

This Lesson provides information on the purpose, operation and components of the Pipe Handling Equipment used on the 320XPC Drill Models.

**Objectives:**

Upon completion of this Lesson the student will:

- Describe the purpose of the Pipe Handling System.
- Identify the main sub systems and components of the Pipe Handling System.
- Identify the location of the sub systems and components of the Pipe Handling System.
- Describe the purpose of the Pipe Rack.
- Identify the main components of the Pipe Rack.
- Identify the location of the sub systems and components of the Pipe Rack.
- Describe the purpose of the Breakout Wrench.
- Identify the main components of the Breakout Wrench.
- Identify the location of the sub systems and components of the Breakout Wrench.
- Describe the purpose of the Deck Wrench.
- Identify the main components of the Deck Wrench.
- Identify the location of the sub systems and components of the Deck Wrench.

**Lesson Outline:**

- Topic 1 Pipe Handling Equipment Overview
- Topic 2 Pipe Rack
- Topic 3 Breakout Wrench
- Topic 4 Deck Wrench

## Lesson 12.2 320XPC Leveling System

**Lesson Description:**

This Lesson provides information on the purpose, operation and components of the Leveling system. This Lesson will show how the leveling system works and all the components involved in its operation.

**Objectives:**

Upon completion of this Lesson the student will:

- Describe the purpose of the Leveling System Assembly.
- Identify the main components of the Leveling System Assembly.
- Identify locations of the components.
- Describe the purpose of the Jacks.
- Identify the main components of the Jacks.
- Describe the theory of operation of the leveling system.

**Lesson Outline:**

- Topic 1 Leveling System Overview
- Topic 2 System Components
- Topic 3 Leveling System Operation

## Lesson 13.2 320XPC Auto Lubrication System

**Lesson Description:**

In this Lesson the lubrication of the Drill's assemblies are explained. The auto lubrication system is one of the key systems on the Drill and ensures the operator that the machine will keep working well when lubricated correctly.

**Objectives:**

Upon completion of this Lesson the student will:

- Understand the different types of lubrication used on the 320XPC Drill.
- Know the components used lubrication different assemblies of the Drill.
- Understand the Automatic Lubrication Systems operation and its components.

**Lesson Outline:**

- Topic 1 Drill Lubrication Overview
- Topic 2 Auto Lubrication System Components
- Topic 3 Auto Lubrication System Operation

### Lesson 14.2 320XPC Electrical System

**Lesson Description:**

In this Lesson you will learn about the 320XPC electrical system, from where the power starts to how the components come together to achieve motion. This Lesson will help you become familiar with the electrical system and its components making for better troubleshooting and maintenance.

**Objectives:**

Upon completion of this Lesson the student will:

- Understanding of the theory of the electrical systems operation.
- Understand what components make up the 320XPC electrical system.
- Understand the systems components and what they do to make the system function.

**Lesson Outline:**

- Topic 1 Electrical System Introduction
- Topic 2 Electrical Components