Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

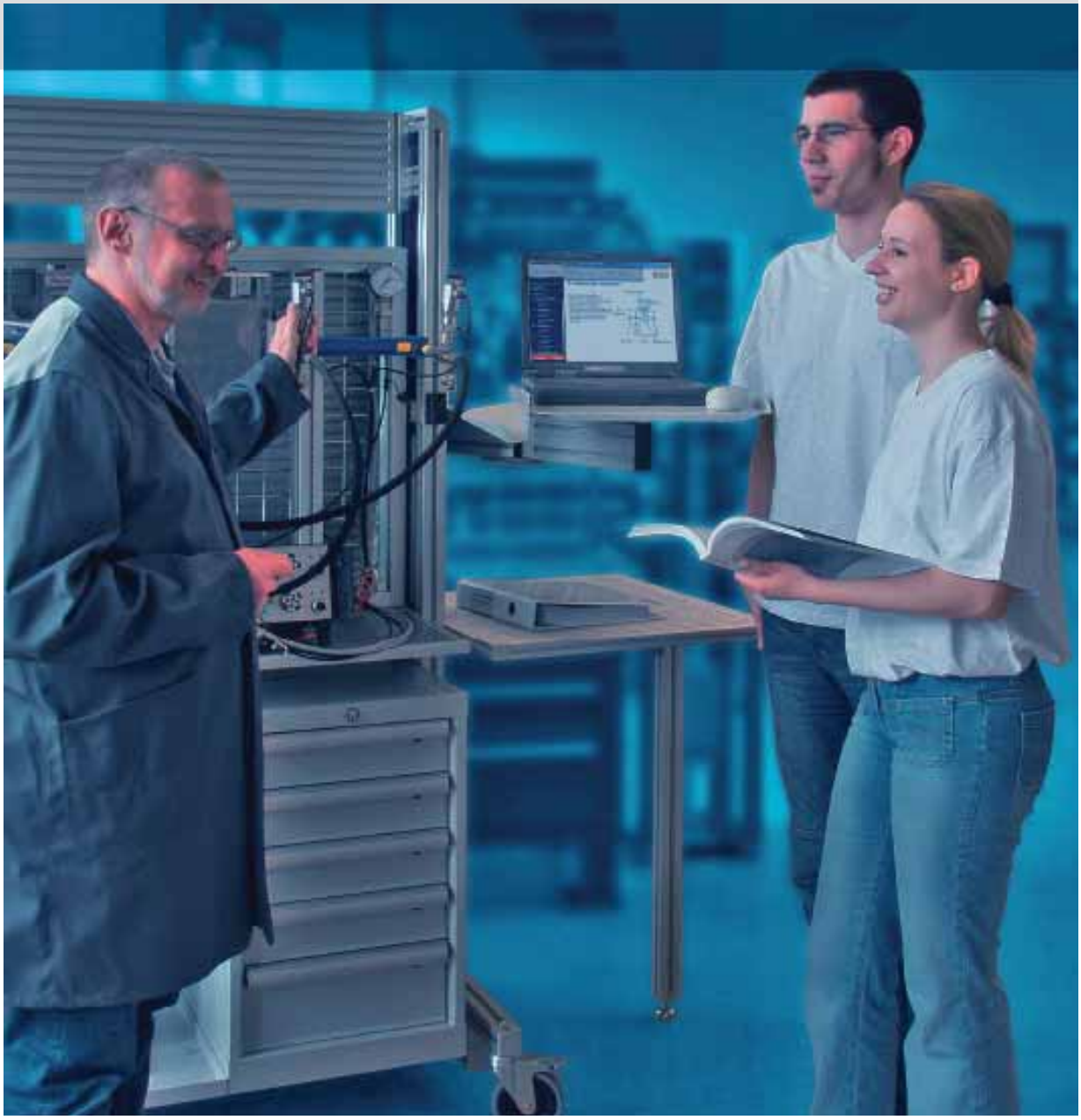
2008 Hydraulics Technical Training Schedule

Quality Education in the Science of Fluid Power

Professional Advanced Training is Key to Success

The term *Learning for Life* has long ago turned into *Lifelong Learning*. To undergo a lifelong development process that will never end we have to learn continuously. Only those who have the required knowledge will be able to position themselves effectively in the long run. Societies have become more global; the number of potential competitors is growing constantly. In today's competition of the best, we have to compare and prove ourselves on a global basis. Apart from experience, openness towards innovation and positive thinking play a critical roll.

Rexroth imparts first-hand knowledge and skills with competent teaching and training systems in line with practical needs and offers the associated teaching and training materials – everything that safeguards your standing on a global market.



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Hydraulics – US and Canadian

Locations

Hydraulics – US

Pennsylvania (BAVTS)
Bethlehem Area Vocational
Technical School
Bethlehem, Pennsylvania

Washington (SCC)
Spokane Community College
Spokane, Washington

Hydraulics – Canada

Canada (ON)
Bosch Rexroth Canada
Burlington, Ontario

Canada (BC)
Bosch Rexroth Canada
Burnaby, British Columbia

Canada (AB)
Bosch Rexroth Canada
Edmonton, Alberta

About our Classes

Bosch Rexroth Corporation is committed to quality fluid power training. Based on this commitment, our Training Department has developed a series of courses that are meeting the training needs of industry. Our course offerings are targeted toward those individuals who maintain hydraulic systems and those who design new systems or want to upgrade existing systems with new technology.

On the maintenance side, we begin with the Principles of Hydraulics (POH) class, with six additional hands-on performance intensive courses. This will lead to a solid foundation in hydraulic principles and an effective working knowledge of maintenance concepts and practices. Our course material will cover information pertaining to systems maintenance, as well as current individual component repair, service, set-up and testing procedures.

The design and engineering side also begins with our Principles of Hydraulics, with as many as four more courses that will aid the engineering oriented person in the design of a system. These skills can be applied to new applications or the upgrading of an already existing system. This exposure will assist in the proper sizing and selection of valves, actuators, conductors, and drive units.

Remember, whether you are in maintenance or engineering, you can count on quality hydraulic training at any Bosch Rexroth Training Center you select.

On-Site and Regular Scheduled Classes Reality Based Hydraulic Training that will Meet Two Different Needs

Which one is best for you?

Regularly scheduled classes in hydraulics technology offered at our training facilities (see this catalog for class types, locations and dates).

Custom machine specific and/or process specific hydraulic training at your facility based on your actual hydraulic operating equipment (call us at 610-694-8407 or email us at trell.hollinger@boschrexroth-us.com for information and a free proposal from a hydraulics specialist).

Hydraulics On-Site Training Programs

The need for training on specific hydraulic installations, both for new and existing equipment, is routinely accomplished through our on-site training programs. Last year we provided instruction to many students through various on-site training programs. With regard to new equipment installations, we have provided these on-site training seminars to train your employees in proper start-up and preventive maintenance procedures. The hydraulic circuit and control theory is also covered in detail.

Customized training programs are developed and taught on a daily basis by our staff of fluid power instructors. Analysis includes component function, calibration procedures, troubleshooting techniques and overall system operation.

On-site training does not have to be on capital equipment. We can also provide basic hydraulic training in addition to the maintenance/troubleshooting formats. To satisfy system engineers and designers, we also offer an on-site servo, proportional, or pump controls seminar at your facility.

We study the hydraulic and the electronic control circuitry of your machines, then a course outline is developed based upon the schematics and bills of material list you provide. These course outlines are designed to present a very methodical approach to system training.

As an integral part of on-site training, our textbooks are available for your on-site seminar and future reference. In addition to these textbooks is our complete library of data and parts sheets, which can be presented in a maintenance manual format on all components used on your machine. Slides, schematics, and other materials are available to promote customized training. The price for these seminars is quoted upon request with no obligation. For further information, please contact our training coordinator, Trell-Marie Hollinger at (610) 694-8407, or e-mail trell.hollinger@boschrexroth-us.com. In Canada, call (905) 335-5511, or send an e-mail to: training@boschrexroth.ca.

For faster service, please provide us with circuit schematics, bills of material, number of participants, location and whether any textbook is desired.

US and Canada – Hydraulic Training

POH
Principles of Hydraulics

Industrial and mobile hydraulic equipment maintenance personnel learn the principles of hydraulics

What you will learn –

- Principles of fluid flow and pressure, work, power, actuator speed for industrial and mobile hydraulic systems
- Power consumed by hydraulic systems and why hydraulic systems get hot
- Hydraulic component symbols typically used in industrial and mobile systems
- Reading and interpreting basic industrial and mobile hydraulic schematics
- Function and use of pressure control valves
- Function and use of directional control valves commonly used in industrial and mobile hydraulic systems
- Load control and load holding techniques
- Types and operation of hydraulic pumps
- Characteristics of modern variable displacement pumps
- Setup of pressure regulating variable displacement pump controls
- Setup of adjustable hydraulic components used in industrial and mobile hydraulic systems
- 10 fundamental circuits most often used in industrial and mobile hydraulic systems
- How flow controls work to control actuator speed
- Using a variable displacement pump to control actuator speed in mobile hydraulic systems
- Function and operation of cylinders and hydraulic motors
- Function and use of a valve's "X" and "Y" ports
- Introduction to fluid cleanliness and filtration
- Introduction to electro-proportional hydraulic valves
- Knowledge reinforcement with hands-on lab exercises

5 Days

Date	Location
Jan 14–18, 2008	Canada (ON)
Jan 28–Feb 1, 2008	BAVTS (PA)
Feb 25–29, 2008	Canada (AB)
Feb 18–22, 2008	BAVTS (PA)
Mar 10–14, 2008	BAVTS (PA)
Apr 7–11, 2008	BAVTS (PA)
Apr 14–18, 2008	Canada (BC)
May 12–16, 2008	BAVTS (PA)
May 26–30, 2008	Canada (ON)
Jun 2–6, 2008	SCC (WA)
Jun 16–20, 2008	BAVTS (PA)
Jul 7–11, 2008	BAVTS (PA)
Aug 11–15, 2008	BAVTS (PA)
Sep 15–19, 2008	BAVTS (PA)
Oct 6–10, 2008	Canada (ON)
Oct 20–24, 2008	BAVTS (PA)
Nov 10–14, 2008	Canada (ON)

This is a 1st level hydraulics training course for both industrial and mobile hydraulic equipment maintenance personnel. This training course is recommended for those who are new to hydraulically powered and controlled machines and equipment and for those who have had no prior formal training in hydraulics technology. This training course is also highly recommended for plant engineering personnel and mobile equipment engineering personnel who are tasked with hydraulic system improvement, system modifications and system design. Principles of Hydraulics was developed with the idea that hydraulic systems are best understood and that hydraulic system problems are more efficiently resolved by those who understand the physical principles that apply to industrial and mobile hydraulics.

Prerequisites: Proficiency in reading and math

Approximately 50% lecture and 50% hands-on lab

Tuition $1,500.00 (includes seminar fee, all student materials, textbook, daily lunch & refreshments)

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

MHT

Mobile Hydraulic Technology

Mobile maintenance technicians and mobile hydraulic system designers will develop their understanding of specific components and circuits used in mobile equipment

5 Days

Date	Location
Mar 3–7, 2008	BAVTS (PA)

What you will learn –

- Overview of hydraulic components and circuits used on mobile equipment
- Review of the principles of hydraulic fluid flow, fluid pressure, power and speed control
- Mobile hydraulic system efficiency and heat generation
- Hydraulic component schematic symbols
- Reading and interpreting mobile hydraulic schematics
- Open and closed loop pumping systems for transmitting fluid energy
- Understanding hydraulic cylinders and hydraulic motors
- Load control and load holding valves and techniques – braking valves
- Pressure relief valves for system pressure control, cylinder port reliefs and hydraulic motor cross port reliefs
- The application of pressure reducing valves with mobile hydraulic systems
- Mobile modular directional controls and various types of valve operators
- Load sensing/compensation as separate control circuits or as integrated into mobile modular directional controls
- Flow dividing
- High pressure hydraulic hose types and sizing information – other types of fluid conductors
- Hydraulic fluids and fluid maintenance

This training course provides fundamental and necessary information on hydraulic principles as these principles are applied and implemented in mobile hydraulic powered and controlled machinery. While there are many similarities to industrial and stationary hydraulic systems there are also many differences with how hydraulics is applied in mobile machinery. The hydraulic components and methods used in mobile equipment will be the specific emphasis of this training course.

Prerequisites: Proficiency in reading and math

Classroom lecture and hands-on lab exercises

Tuition: $1,500.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

MRS

Maintenance, Repair & Setup of Industrial Hydraulic Systems

Maintenance personnel learn proper methods of maintenance and troubleshooting

What you will learn –

- Logical schematic reading and schematic interpretation
- Why hydraulic systems get hot and what to do about excess heat
- Hydraulic fluid cleanliness and condition standards
- Understanding relief valves – disassembly, inspection, assembly, testing
- Understanding pressure reducing valves – disassembly, inspection, assembly, testing
- Understanding directional control valves – disassembly, inspection, assembly, testing
- Understanding the various forms of hydraulic related shock and problems it causes
- External fluid leaks and how to eliminate them
- Directional control pilot chokes – slow shift directional control valves
- Controlling pilot pressure with pilot operated directional control valves
- Troubleshooting exercises to develop efficient hydraulic diagnostic skills
- Understanding variable displacement pumps – understanding pump pressure type pump controls
- Pump replacement, commissioning and control setup
- Review fundamental hydraulic circuits used in most hydraulic systems – operation and setup
- Knowledge reinforcement with hands-on lab exercises

5 Days

Date	Location
Jan 28–Feb 1, 2008	Canada (ON)
Feb 25–29, 2008	BAVTS (PA)
Apr 14–18, 2008	BAVTS (PA)
Jun 23–27, 2008	BAVTS (PA)
Jul 7–11, 2008	Canada (ON)
Aug 18–22, 2008	BAVTS (PA)
Sep 8–12, 2008	SCC (WA)
Oct 13–17, 2008	BAVTS (PA)
Nov 3–7, 2008	Canada (AB)
Nov 10–14, 2008	BAVTS (PA)
Nov 17–21, 2008	Canada (ON)
Dec 1–5, 2008	Canada (ON)

This is a 2nd level industrial hydraulics training course developed for the maintenance technician. This training course is a logical next-step seminar after POH for your understanding of industrial hydraulics. It is recommended for plant maintenance personnel who have responsibility for the proper upkeep of industrial systems. Students work in the classroom and in the lab to develop their hydraulic component and circuit understanding. This seminar will address methods for correcting some hydraulic shock related problems and the elimination of external leakage problems.

Prerequisites: POH or prior formal industrial hydraulics technology training required for enrollment in MRS

More than 50% lab and student work exercises

Tuition: $1,500.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

MRSM

Maintenance, Repair & Setup of Mobile Hydraulic Systems

Mobile hydraulic maintenance personnel learn proper methods of maintenance and troubleshooting

What you will learn –

- Review of hydraulic principles as these principles relate to mobile hydraulics technology
- Hydraulic cylinders – operation and troubleshooting
- Understanding fixed displacement and variable displacement hydraulic motors
- Operation and setup of popular variable displacement hydraulic motor controls
- Pressure relief valves for system pressure control, port relief valves for cylinders and crossport relief valves for hydraulic motors – operation and setup
- Directional control valves – standard spool valves and mobile modular directional control valves – understanding the operation and the application of different types of spools
- Load sensing as separate control circuits and load compensation incorporated into mobile type directional control valves
- Load control and load holding techniques – operation and setup
- Understanding popular open loop pumps and closed loop pumps
- Displacement type pump controls – operation and setup
- Flow dividers
- Fluid conductors – types, sizing and selection – hose and pressure rated tube
- Fluid cleanliness and condition
- Filtration – tank breathers and fluid filters

5 Days

Date	Location
Mar 31–Apr 4, 2008	Canada (ON)
Jun 9–13, 2008	Canada (ON)
Jul 14–18, 2008	BAVTS (PA)
Sep 29–Oct 3, 2008	Canada (BC)

This is a 2nd level mobile hydraulics training course developed for the mobile maintenance technician. This training course is a logical next-step seminar after either the POH seminar or the MHT seminar for your understanding of mobile equipment hydraulic systems. It is recommended for mobile maintenance personnel who have responsibility for the proper upkeep of mobile systems. Students work in the classroom and in the lab to develop their hydraulic component and circuit understanding.

Prerequisites: POH or MHT or equivalent training and knowledge

Approximately 50% lecture and 50% lab exercises

Tuition: $1,500.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

FSP

Fundamentals & Servicing of Proportional Valves

Plant maintenance personnel of all levels learn the function & operation of electro-proportional hydraulic valves and their interface electronic amplifiers – recommended for the mechanical trades and the electrical trades

What you will learn –

- Understand the similarities between standard (fixed voltage solenoid, spool type) directional control valves and electro-proportional directional control valves
- Understand the principles of speed control (throttle valve principle)
- Compare and contrast force controlled and stroke controlled solenoids as applied to electro-proportional valves
- The control of actuator direction, speed, acceleration/deceleration with proportional valves
- Ideas of proper proportional directional control valve sizing
- Understanding electro-proportional pressure control valves
- Compare and contrast spool position feedback proportional valves verses non-spool position feedback valves
- Standard proportional directional control valves
- High performance and servo solenoid proportional directional control valves
- Proportional flow control valves
- Electronic interface amplifiers that are used to drive proportional valves
- Integrated electronics/on-board electronics valves
- Rexroth branded and Bosch branded proportional valves
- Troubleshooting proportional valve systems and isolate problems

5 Days

Date	Location
Feb 11–15, 2008	Canada (ON)
Feb 11–15, 2008	BAVTS (PA)
May 5–9, 2008	BAVTS (PA)
Sep 29–Oct 3, 2008	BAVTS (PA)
Nov 17–21, 2008	BAVTS (PA)

Electro-proportional hydraulic valves have become a main stream component in most hydraulic powered and controlled machines and processes. These valves are an active part of the process control system. It is important that mechanical and electrical maintenance personnel develop a thorough understanding of how these valves are applied and how they operate. For this purpose there will be ample time devoted to the disassembly, inspection and assembly of several valve types. Students will configure the electronic interface amplifier and put the proportional valve in a hydraulic circuit to observe the operation. Through this hands-on approach, students will develop their setup and troubleshooting skills. This 5 day training course is also a proper starting point for plant engineering personnel prior to their attendance in our advanced PSD course.

Prerequisites: POH or prior formal industrial hydraulics technology training required for enrollment in FSP

Approximately 50% lecture and 50% hands-on lab exercises

Tuition: $1,600.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

PCO

Pumps and Controls – Open Loop

Advanced maintenance technicians and hydraulic system designers develop their knowledge of popular variable displacement pumps and pump controls used in open loop pumping systems

What you will learn –

- Types and characteristics of variable displacement pumps
- Types and characteristics of open loop pump controls including proportional controls for pumps
- Sizing pumps to meet the flow requirements and pressure requirements of the hydraulic system
- How to interpret pump technical data sheets to understand pump characteristics and pump control operation
- Pump suction inlet condition requirements and calculations
- Pump case drain pressure
- Applying pumps with through-drives and quantifying the shaft torque and bending moment values comparing them to maximum values to the selected pump
- Understanding how adverse operating conditions can limit pump life – fluid temperature, viscosity, cleanliness – the use of fluids other than standard mineral type fluids
- Pump commissioning – pump operation troubleshooting
- Setup of pump controls

5 Days

Date	Location
Mar 31–Apr 4, 2008	BAVTS (PA)
Aug 4–8, 2008	BAVTS (PA)

This 5 day training course develops the student's knowledge of the internal operation of popular variable displacement pumps and the operation/setup of various pump controls. Maintenance technicians can use the information presented during this seminar to insure pump performance and to provide good pump life. Engineering personnel develop their knowledge of proper pump/pump control selection and pump sizing. Students disassemble variable displacement piston pumps to reinforce their understanding of pump operation. Students will operate and setup the assembled pump.

Prerequisites: POH and MRS or equivalent knowledge

Classroom lecture, discussion, lab exercises/lab demonstrations and student work problems

Tuition: $1,550.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

PCC

Pumps and Controls – Closed Loop

Advanced maintenance technicians and hydraulic system designers develop their knowledge of popular variable displacement pumps and pump controls used in closed loop pumping systems

What you will learn –

- Types and characteristics of variable displacement pumps
- Types and characteristics of closed loop pump controls including proportional controls for pumps
- Sizing pumps to meet the flow requirements and pressure requirements of the hydraulic system
- How to interpret pump technical data sheets to understand pump characteristics and pump control operation for closed loop pumping systems
- Troubleshooting, setup, commissioning of closed loop pump systems
- Pump case drain pressure
- Understanding fixed and variable displacement hydraulic motors used in closed loop pumping systems
- Understanding how adverse operating conditions can limit pump life – fluid temperature, viscosity, cleanliness – the use of fluids other than standard mineral type fluids
- Pump commissioning – pump operation troubleshooting
- Setup of pump controls

5 Days

Date	Location
May 19–23, 2008	BAVTS (PA)
Aug 25–29, 2008	BAVTS (PA)

This 5 day training course develops the student's knowledge of the internal operation of popular variable displacement pumps and the operation/setup of various pump controls. Maintenance technicians can use the information presented during this seminar to insure pump performance and to provide good pump life. Engineering personnel develop their knowledge of proper pump/pump control selection and pump sizing. Students disassemble variable displacement piston pumps to reinforce their understanding of pump operation. Students will operate and setup the assembled pump.

Prerequisites: POH and MRS or equivalent knowledge

Classroom lecture, discussion, lab exercises/lab demonstrations and student work problems demonstrations

Tuition: $1,550.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

DCH

Design Considerations for Industrial Hydraulic Systems

Advanced maintenance technicians and hydraulic project engineers learn to properly select hydraulic components that will produce efficient hydraulic circuits and hydraulic circuits that properly control the machine or process.

What you will learn –

- The concepts of “fast” and “slow” hydraulic systems
- The principles of speed control (throttle valve speed control systems)
- The proper use of energy (power) in a hydraulic system to achieve optimal performance
- The use of energy (power) in a hydraulic system to achieve optimal efficiency
- Hydraulic valve performance characteristics through proper interpretation of valve catalog data
- Sizing of hydraulic valves through proper interpretation of valve catalog data
- Calculation of pressure requirements – calculation of actuator and total system flow requirements
- Calculation of system power requirements
- The proper control of pressure spikes and hydraulic related shock
- Evaluating the load and calculate the reflected mass at the hydraulic actuator
- Analyze the static and dynamic load requirements and convert these calculations to pressure, flow rates and a possible hydraulic control circuit type
- Concepts of minimum acceptable acceleration and deceleration times
- Introduction to the use and calculation of natural frequency
- Considerations of appropriate pump systems

5 Days

Date	Location
Mar 3–7, 2008	Canada (ON)
Jul 28–Aug 1, 2008	BAVTS (PA)

This 5 day training course is a must for plant personnel tasked with hydraulic system improvement or with the development of initial design concepts for a new hydraulic application. Students receive the tools they need to properly evaluate the load to be moved and controlled and to select appropriate hydraulic valves for this purpose. Classroom lecture and discussion will be balanced with various system component selection and sizing problems.

Note: *Students are required to bring calculators to this training course*

Prerequisites: Students will gain admittance to DCH only after their successful completion of the Bosch Rexroth POH seminar. Students must have the ability to manipulate and transpose various hydraulic related algebraic equations.

Classroom lecture, discussion and student work problems

Tuition: $1,600.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

DCHM

Design Considerations for Mobile Hydraulic Systems

5 Days

Date	Location
Oct 20–24, 2008	Canada (ON)
Oct 27–31, 2008	BAVTS (PA)

Advanced maintenance technicians and hydraulic project engineers learn to properly select hydraulic components that will produce efficient hydraulic circuits that properly control mobile equipment.

What you will learn –

- Review of hydraulic principles – calculation of required pressure, required flow and required power
- Hydraulic actuator (cylinder or motor) speed control – throttle valve principle or displacement controlling pumps
- Open pump loop verses closed pump loop with displacement controlled pumps
- Selection of relief valves for system pressure control, cylinder port relief, motor cross port relief applications
- Selection and sizing of pressure reducing valves
- Selection and sizing of standard directional control valves and mobile modular directional control valves of various spool types
- The use of hydraulic proportional directional controls with reducing type joy pilot control units (foot pedal and joy stick)
- Load sensing/compensation type directional controls
- Flow dividers for unequal loads on multiple actuators
- Directional control valve circuits
- The operation and possible requirement for load holding and load control - circuits
- Pressure controlled variable displacement open loop pumps operation, application/selection and sizing
- Displacement controlled pumps in open pump loop operation, application/selection and sizing
- Displacement controlled pumps in closed pump loop operation (hydrostatic drive) with hydraulic motor/s
- Application and sizing of fixed displacement and variable displacement hydraulic motors
- Student sizing and selection work problems
- Fluid conductor sizing – the proper use of pressure rated hose and other fluid conductors
- The use of energy (power) in a hydraulic system to achieve optimal efficiency
- Hydraulic valve performance characteristics through proper interpretation of valve catalog data
- Sizing of hydraulic valves through proper interpretation of valve catalog data
- Calculation of pressure requirements – calculation of actuator and total system flow requirements
- Calculation of system power requirements

This 5 day training course is a must for mobile hydraulics technicians and engineers tasked with hydraulic system improvement or with the development of initial design concepts for a new mobile hydraulic application. Students receive the tools they need to properly evaluate the load to be moved and controlled and to select appropriate hydraulic valves for this purpose. Classroom lecture and discussion will be balanced with various system component selection and sizing problems for various mobile hydraulic systems.

Note: *Students are required to bring calculators to this training course*

Prerequisites: Students will gain admittance to DCHM only after their successful completion of the Bosch Rexroth POH seminar. Students must have the ability to manipulate and transpose various hydraulic related algebraic equations.

Classroom lecture, discussion and student work problems

Tuition: $1,600.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

PSD

Proportional & Servo Circuit Design

Engineering personnel and hydraulic project engineers who are responsible for the implementation and design of proportional valve and servo valve circuitry will develop the design concepts they need for the proper application of components to achieve good control of a hydraulic axis.

What you will learn –

- Proportional valve and servo valve selection & sizing criteria
- Selecting the appropriate valve for the application
- Valve frequency of response and valve stepped response applied
- Proportional and servo valve circuit design concepts
- Proper control of pressure, speed, acceleration/deceleration and limiting hydraulic related shock
- Understanding the nature of a spring mass system
- Open process loop vs. closed process loop to achieve proper control
- Evaluating the load's reflected mass at the actuator
- Natural frequency calculations for hydraulic cylinders and hydraulic motors

5 Days

Date	Location
Apr 21–25, 2008	BAVTS (PA)

This 5 day training course develops design concepts with the proper application of proportional and servo valves. Engineering personnel learn to properly select and size a proportional or servo valve. This is an appropriate next-step training course after completion of our DCH course

Prerequisites: DCH course or equivalent – ability to manipulate algebraic equations

Classroom lecture, discussion, lab exercises/lab demonstrations and student work problems

Tuition: $1,600.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

ECH

Electronic Controls for Hydraulic Systems

Advanced plant maintenance technicians, hydraulic system designers and controls engineers develop their knowledge of the electronic control of electro-proportional hydraulic valves used in closed process loop systems.

5 Days

Date	Location
Sep 22–26, 2008	BAVTS (PA)

What you will learn –

- Advantages and disadvantages of 3 closed loop control concepts
- Analog closed process loop control
- Understand the nature of digital controller platforms
- Digital closed loop control with analog process feedback
- Digital closed loop control with digital process feedback
- Develop understanding of the Bosch Rexroth DMX digital controller
- Develop understanding of the Bosch Rexroth HACD digital controller (major emphasis)
- Operation, setup/programming, and loop tuning of the DMX and the HACD controllers
- Selection and application of closed loop controllers using technical data sheets and operation and setup documentation

This 5 day training course develops the student's knowledge of the internal operation and setup of the electronics used for hydraulic closed process controls that are used to drive proportional and servo valves. Hydraulic system designers and controls engineers can use the information presented in this training course to define the application requirements and to select, setup and tune the appropriate closed loop controller. Students learn the potential and limits of hydraulic axis control using closed loop controllers.

Note: *Students are encouraged to bring their lap top computers*

Prerequisites: PSD or equivalent knowledge

Classroom lecture, discussion, lab exercises/lab demonstrations and student work problems

Tuition: $1,600.00 (includes seminar fee, all student materials, text book, daily lunch & refreshments)

PPM

Piston Pumps/Motors and Controls

Advanced plant maintenance technicians and hydraulic system designers develop their knowledge of popular fixed and variable displacement piston pumps/motors and controls used in open loop, closed loop and semi-closed loop hydraulic systems.

What you will learn –

- Types and characteristics of fixed and variable displacement piston pumps and motors
- Circuit selection criteria for open loop, closed loop or semi-closed loop circuits
- Types and characteristics of open and closed loop pump controls including both hydraulic and electronic pressure and displacement controllers.
- Sizing pumps to meet the flow requirements and pressure requirements of the hydraulic system
- Sizing motors to meet the mechanical speed and torque requirements of the machine
- Open loop pump suction, inlet and case drain condition requirements and calculations
- Hydraulic fluid cleanliness and condition requirements for axial piston pumps and motors
- Pump and motor commissioning, setup, control adjustment and troubleshooting

5 Days

Date	Location
May 5–9, 2008	Canada (ON)
Sep 15–19, 2008	Canada (ON)

This 5 day training course develops the student's knowledge of the internal operation of popular fixed and variable displacement piston pumps and motors and the operation /setup of various controllers. .Maintenance technicians can use the information presented to insure pump performance and to provide good pump life. Engineering personnel develop their knowledge of proper pump/motor control selection and sizing.

Prerequisites: POH and MRS/DCH or equivalent knowledge classroom lecture, discussions, laboratory exercises and lab demonstrations

Price: $1,550.00

For Canadian Enrollment:
Bosch Rexroth Canada
Call: (905) 335-5511
e-mail: training@boschrexroth.ca

Registration for Hydraulic Courses – **US Only**

Registration can be made Monday through Thursday by calling our training coordinator, Trell-Marie Hollinger at (610) 694-8407, emailing her at trell.hollinger@boschrexroth-us.com, *or by sending a copy of this form and a check or purchase order made payable to the appropriate Training Center listed at the right.*

Please issue a check or purchase order made payable to the training center you will attend (refer to course location right).

After you register, you will receive a confirmation which includes: tuition payment information, suggested hotels, map and course info sheet *(please read carefully)*.

Important Note:

A Check or P.O must be received two weeks prior to the start of the course or registration will be cancelled!

I wish to enroll in the following course (please check **one**):

■	**POH**	Principles of Hydraulics *(formerly Basic Industrial Hydraulics)*	5 days	$1,500
■	**MHT**	Mobile Hydraulic Technology	5 days	$1,500
■	**MRS**	Maintenance, Repair, & Set-up of Industrial Hydraulics	5 days	$1,500
■	**MRSM**	Maintenance, Repair, & Set-up of Mobile Hydraulics	5 days	$1,500
■	**FSP**	Fundamentals & Servicing of Proportional Valves	5 days	$1,600
■	**PCO**	Pump & Controls - Open Loop	5 days	$1,550
■	**PCC**	Pump & Controls - Closed Loop	5 days	$1,550
■	**DCH**	Design Considerations for Industrial Hydraulics	5 days	$1,600
■	**DCHM**	Design Considerations for Mobile Hydraulics	5 days	$1,600
■	**PSD**	Proportional & Servo Circuit Design	5 days	$1,600
■	**ECH**	Electronic Controls for Hydraulic Systems	5 days	$1,600

Please issue Check or Purchase Order Payable to:

BAVTS
Bethlehem, PA

Bethlehem Area Votech
c/o Bosch Rexroth Corporation
Attn: Training Dept.
P.O. Box 25407
Lehigh Valley, PA 18002-5407
Fax: (610) 694-8339

SCC
Spokane, WA

Spokane Community College
c/o Bosch Rexroth Corporation
Attn: Training Dept.
P.O. Box 25407
Lehigh Valley, PA 18002-5407
Fax: (610) 694-8339

Registration closes **TWO** weeks prior to the start of each course.
No enrollments will be accepted after that date.

Please complete the following (Duplicate form if necessary):

Course Date

Course Location

Name Title

E-mail

Company Name

Company Address

City State Zip

Business Phone Fax (if applicable)

Rexroth
Bosch Group

Bosch Rexroth Corporation
Industrial Hydraulics
2315 City Line Road
Bethlehem, PA 18017-2131
Telephone (610) 694-8300
Facsimile (610) 694-8467
www.boschrexroth-us.com

Bosch Rexroth Corporation
Mobile Hydraulics
1700 Old Mansfield Road
Wooster, OH 44691-0394
Telephone (330) 263-3300
Facsimile (330) 263-3333

Bosch Rexroth Corporation
Mobile Hydraulics
8 Southchase Court
Fountain Inn, SC 29644-9018
Telephone (864) 967-2777
Facsimile (864) 967-8900

Bosch Rexroth Corporation
Corporate Headquarters
5150 Prairie Stone Parkway
Hoffman Estates, IL 60192-3707
Telephone (847) 645-3600
Facsimile (847) 645-6201

Bosch Rexroth Corporation
Electric Drives and Controls
5150 Prairie Stone Parkway
Hoffman Estates, IL 60192-3707
Telephone (847) 645-3600
Facsimile (847) 645-6201

Bosch Rexroth Corporation
Linear Motion and
Assembly Technologies
816 E. Third Street
Buchanan, MI 49107
Telephone (269) 695-0151
Facsimile (269) 695-5363

14001 South Lakes Drive
Charlotte, NC 28273
Telephone (800) 438-5983
Facsimile (704) 583-0523

Bosch Rexroth Corporation
Pneumatics
1953 Mercer Road
Lexington, KY 40511-1021
Telephone (859) 254-8031
Facsimile (859) 281-3491

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