

Basic Hydraulic Training October 11-14, 2010

Learn the principles of industrial hydraulic technology in a small class environment utilizing real world examples, components for inspection and disassembly, and a hands on lab. See page 2 for more details.

Cost: -----

\$650 per person or
\$525 per person for groups of 2 or more

Location: -----

CMA/Flodyne/Hydradyne
1000 Muirfield Drive
Hanover Park, IL 60133

Register: -----

Submit form on page 4

Online at www.cmaf়h.com

Via telephone: call 630-563-3628

Advanced Hydraulic Training November 15-18, 2010

This class is for those who already have a good understanding of industrial hydraulic principals, therefore, completion of Basic Hydraulic Training is required before taking this course. Please bring your textbook, *Using Industrial Hydraulics* to class. See page 2-3 for more details.

Cost: -----

\$650 per person or
\$525 per person for groups of 2 or more

Location: -----

CMA/Flodyne/Hydradyne
1000 Muirfield Drive
Hanover Park, IL 60133

Register: -----

Submit form on page 4

Online at www.cmaf়h.com

Via telephone: call 630-563-3628

REGISTER

CMA/Flodyne/Hydradyne

**H
Y
D
R
A
U
L
I
C**

- *Accredited Instructors
- *Affordable, Reputable
- *Since 1985





Training Program

What Customers are saying

"This class has improved my skill level...I can go back and apply what I have learned immediately."
Bryan T. maintenance technician, Schaumburg, IL

"The instructor cared very much that we understood the concepts, he was dynamic, extremely knowledgeable and made the class interesting!"
Mike R. manufacturing engineer, Chicago, IL

General information for both sessions:

Daily Schedule:

7:30 a.m. — 8:00 a.m.	Continental breakfast
8:00 a.m. — 12:00 p.m.	Training
12:00 p.m. — 1:00 p.m.	Lunch Provided
1:00 p.m. — 5:00 p.m.	Training

Dress is casual, all textbooks, materials and lunches provided and certificates are awarded upon completion, Training is held in the CMAFH Training Center in Hanover Park, IL.

Class size is limited, please register early to guarantee a seat. Forms of payment accepted are purchase order or credit card. Please provide method of payment during registration.

Basic Hydraulic Training General Outline

October 11-14, 2010

- Introduction to Industrial Hydraulics Technology, what is a hydraulic powered machine
- Understanding hydraulic energy and hydraulic power – heat production of hydraulic systems
- Relationship of force, area and pressure – pressure to develop force and tonnage
- Relationship of torque, displacement and pressure for hydraulic motors
- Relationship of fluid flow, GPM and actuator speed
- How hydraulic speed control works
- Hydraulic component symbols typically used in industrial and mobile systems
- Reading and interpreting basic industrial and mobile hydraulic schematics
- Hydraulic shock, how it is caused and requirements to control actuator acceleration and deceleration
- Understanding relief valves – direct operated, pilot operated and venting options – piloting and draining options and they effect the function and application
- System relief circuits, multiple system pressure relief circuits, port reliefs, cross port relief circuits
- Understanding function and use of directional control valves – direct operated and pilot operated types – spool types and their uses – 2 position vs. 3 position valves – piloting and draining options.
- Regenerative circuits
- Pressure reducing valves, application and operation
- Load sensing
- Multi-function valves, function and application
- Sequence circuits, counterbalance, unloading applications
- Function and operation of hydraulic cylinder and hydraulic motors
- Hydraulic pumps – fixed displacement, variable displacement types – basic pump controls
- Pressure compensated pumps with safety reliefs
- Introduction to proportional hydraulic valves and circuits
- Introduction to high flow logic cartridge valves for directional control and pressure control
- Knowledge reinforcement with hands-on lab exercises

Advanced Hydraulic Training General Outline

November 15-18, 2010

- Review principles of fluid pressure and fluid flow.
- Understand throttle valve speed control
- Review hydraulic valve functions and valve hydraulic schematic symbols
- Positive and fixed displacement pumps and system pressure relief valves
 - Fixed pump types and possible applications
 - Troubleshooting and diagnosing worn pumps
- Variable displacement piston pumps w/ pressure type pump controls
 - Applications with pressure compensated pumps
 - Commissioning of variable displacement pumps
 - Setup of pressure compensated pump controls and coordination of the compensator setting with the setting of the external spike pressure relief
 - Applications with remote pressure compensated pumps
 - Applications and setup of load sensing pump controls
 - Applications and setup of horsepower pump controls
- Variable displacement piston pumps w/ displacement type pump controls
- Lab exercise
 - Setting of an external pilot operated system relief and fixed displacement pump
 - Setting of a variable displacement pump's pressure compensator with an external spike pressure relief

Advanced Hydraulic Training General Outline, cont.

- Fluid condition and cleanliness requirements for modern hydraulic systems
 - Define hydraulic fluid types
 - Fluid contamination and unacceptable levels of fluid contamination
 - Filtration types and standards of filtration
 - Fluid viscosity and viscosity index
- Use and application of accumulators
 - Operational understanding of accumulators
 - Checking gas precharge pressure
 - Setting precharge pressure
- Classroom demonstration – view actual fluid sample slides
- Lab exercise – accumulator circuit – setting accumulator pre charge
- Understanding pilot operated directional controls
 - Operation of a pilot pressure shifted spool, spring returned spool, pilot operated directional control valve
 - The function and use of external piloting of the pilot operated directional control valve
 - The function and operation of external draining of the pilot operated directional control valve
 - The function and operation of pilot choking
- Fundamentals of electro-hydraulic proportional valves
 - Understanding the operation of proportional pressure controls
 - Understanding the operation of proportional directional controls
 - Demonstration of a proportional directional control in use
- Lab exercise
 - Disassembly, inspection, assembly and circuit setup of a pilot operated directional control valve
 - Setup of an integrated electronics, spool position feedback, direct operated directional control valve and operation of a proportional directional control valve in a hydraulic motor circuit
- Classroom schematic reading exercises
 - Reading and interpreting schematics w/ power units built with pressure compensated pumps
 - Reading and interpreting schematics w/ power units built with remote pressure compensated pumps to develop multiple system pressure settings
 - Reading and interpreting pumps with displacement type pump controls
 - Reading and interpreting schematics with metering flow controls or with proportional directional controls
 - Reading and interpreting schematics with proportional pressure controls
 - Reading and interpreting schematics with counterbalance and/or pilot operated check valve circuits
- Lab exercises
 - Build and setup a multi-actuator hydraulic circuit – Circuit #1
 - Build and setup a multi-actuator hydraulic circuit – Circuit #2
- Review of Course Topics, Question and Answer

Did you know?

Industrial Training is an investment in both your individual career and your company's success. Properly trained personnel save their company significantly in the form of reduced downtime and more efficient operations.

CMA/Flodyne/Hydradyne offers custom training based on your requirements and/or your machines, and we also offer private training courses on a number of established topics such as **Hydraulic System Design and Maintenance, Repair and Set-up of Mobile Hydraulic Systems, Fundamentals of Proportional Valves** and more. Please email training@cmafhd.com for a complete listing of available courses.



One of three test stands used in our hands-on lab.

Basic Hydraulic Training

October 11-14, 2010

Advanced Hydraulic Training

November 15-18, 2010



Cost:

\$650 per person or
\$525 per person for two or more
attendees

Register:

Please fill out and submit
registration form or fax
completed registration to
630-563-3850.

You may also register via:

- Telephone: 630-563-3600
- Online at www.cmafz.com

Cancellations: Refunds will be
given for all cancellations made
prior to two weeks before the class.
Cancellations made after that time will
result in attendees being rescheduled
for the next available class.

Location:

1000 Muirfield Drive
Hanover Park, IL 60133 [view map](#)

Recommended Hotels:

Country Inn & Suites
1490 West Lake Street
Roselle, IL 60172
Tel: 630-351-0101
Corporate rate: \$89.00

Indian Lakes Hilton
250 West Schick Road
Bloomington, IL 60108
Tel: 630-351-0101
Corporate rate: \$95.00

Custom training is also available.
Please email training@cmafz.com for
more information.

Questions?

Please call us at 630-563-3600

Register to Attend!

Please duplicate form if necessary.

Name: _____

Position: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____

Email: _____ Telephone: _____

PO: _____

Credit Card: Please call 630-563-3600 with credit card information.

I wish to enroll in the following course(s):

Basic Hydraulic Training October 11-14, 2010

Advanced Hydraulic Training November 15-18, 2010

Additional attendees for the selected course(s):

Name: _____

Position: _____ Email: _____

Name: _____

Position: _____ Email: _____

Name: _____

Position: _____ Email: _____

Name: _____

Position: _____ Email: _____

Name: _____

Position: _____ Email: _____

Name: _____

Position: _____ Email: _____