

*"Very informative. Instead of just trading out parts, we're able to troubleshoot hydraulic problems ourselves."*

- Travis Jackson

# HYDRAULIC TROUBLESHOOTING

## A Three-Day Workshop



### Here's a Sample of What You'll Learn:

- ▶ How to troubleshoot components without removing them from the machine
- ▶ How to properly adjust the system for maximum speed and efficiency
- ▶ The function of hydraulic system components
- ▶ How to use the hydraulic schematic as a troubleshooting tool
- ▶ Reliability checks to ensure machine longevity and uptime

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## Satisfied Customers Say It Best...

"This class has helped me save our company a lot of money this past year. The knowledge you passed on to me about how to reclaim hydraulic oils has been a valuable tool."

*Scott Carrigan, Predictive Maintenance, Shuretape Technologies*

"Your class was very informative as well as entertaining. I have already corrected a couple of problems we were having using the knowledge I received. This not only saves money on parts and equipment, but more importantly it saves downtime."

*Larry Steel, Maintenance, Craftsman*

"Prior to this training, I had very little knowledge of hydraulics. This class has taught me the basics of troubleshooting skills and things to help me assist my mechanics in determining problems so we can lessen our downtime. If you haven't taken this training, you should. It will benefit production supervisors to help electricians and maintenance in troubleshooting problems."

*Gary Colewell, Production Supervisor, JM Huber*

"Very informative. Instead of just trading out parts, we're able to troubleshoot hydraulic problems ourselves."

*Travis Jackson*

## "Vendor-neutral Makes A Difference!"

*Alfredo Romaro,  
Maintenance  
Technician,  
Kawneer Company*



## About This Training

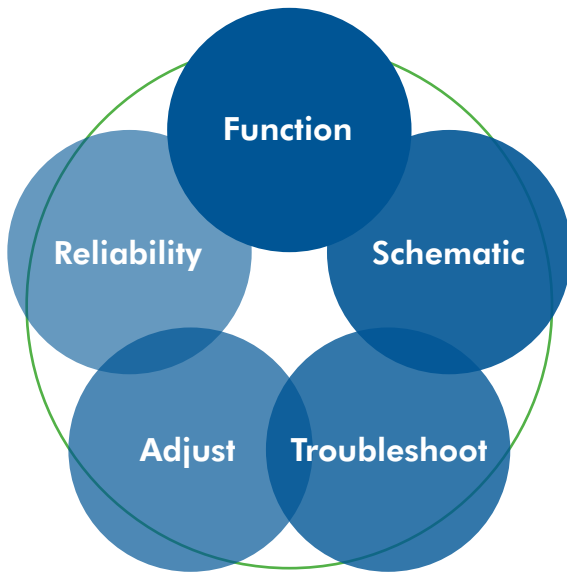
This three-day workshop is designed for electricians, millwrights, supervisors, reliability technicians and anyone who is responsible for the hydraulic maintenance of your plant machinery. Maintenance personnel look at hydraulics differently than engineers, salespeople or manufacturers. This workshop is designed to include the five things a hydraulic troubleshooter needs to know:

- The function of all of the system components
- How to read and use the hydraulic schematic as a troubleshooting tool
- How to troubleshoot individual components, preferably without removing them from the machine
- How to properly adjust the system for maximum speed and efficiency
- The correct reliability checks to ensure machine longevity and uptime

## Apply What You Learn and Reap the Benefits

- **Hydraulic Fundamentals** must be understood to troubleshoot hydraulics. One of the biggest problems in plants today is that the pressure is turned up to increase speed. If system pressures are not properly set, the result can be excessive shock, leaks and heat.
- **Hydraulic Pumps** are usually the first components changed when a hydraulic problem occurs. The pump should never be changed before making the quick tests taught in this section. A step-by-step procedure is explained for setting the pump compensator and the system relief valve.
- **Accumulators** are the most dangerous hydraulic devices in the system. The proper method of bleeding the nitrogen and hydraulic pressure out of the accumulator before removing from the system is covered. The correct procedures for pre-charging and troubleshooting accumulators are explained in detail.
- **Pressure Controls** many times look similar but perform different functions in the system. This portion of the course covers the function, setting and troubleshooting of all normally open and closed pressure controls.
- **Directional Valves** port the oil flow to cylinders and hydraulic motors as well as unload pumps and drain accumulators. You will learn the six main causes of solenoid failure. The symbols and use of two- three- and four-way valves are described.
- **Fluid Maintenance** is often neglected or only receives attention when problems in the system occur. Best-practice oil sampling and filter maintenance methods are explained. Reservoir maintenance standards for breathers, heaters, high-temperature switches, level switches, etc. are specified.
- **Hydrostatic Drives** are commonly used on knucklebooms, cranes, planers, chemi-washers, centrifuges and conveyor drives. These drives are controlled both manually and with servo or proportional valves. The electrical amplifier and hydraulic adjustments for these drives are covered in this training.
- **Proportional Valves, Servo Valves and Linear Positioners** are expensive and are in many cases changed without making any tests. You will learn the proper procedure for installing, adjusting and troubleshooting these components.

# 5 Things a Hydraulic Troubleshooter Must Know



## 1. Function

Of every hydraulic component on the machine, if you do not know what just one component does, there is no way for you to know if it is causing the problem or not.

## 2. Schematic

You must be able to read and use a hydraulic schematic as a troubleshooting tool. The best five minutes spent troubleshooting a machine will be spent reading and tracing the flow on the schematic.

## 3. Troubleshoot

You must know how to troubleshoot individual components, preferably without removing them from the machine. Removing a component unnecessarily risks not only contaminating the machine, but instead of fixing a problem, adding a problem or two.

## 4. Adjust

You must know how to properly adjust a machine. The right component improperly adjusted is no better than the wrong component.

## 5. Reliability

A real hydraulic troubleshooter needs to know the correct reliability checks to avoid unscheduled downtime.

## You Will Learn

- The three tests to determine if a pump is bad before it is changed – in just 15 minutes.
- The very first thing you should do when a hydraulic problem occurs.
- Our four-step pressure setting procedure. This procedure is designed exclusively to reduce heat, shock and leakage in the system.
- You learn how to be certain that when a valve is replaced, the spool, the pilot and drain lines are exactly the same as the original.
- Five causes of aeration and how to identify it.
- How to troubleshoot and adjust servo and proportional valves without contaminating the machine.
- Three problems that cause cavitation in pumps.
- The four ways contamination enters the system and how to control it – PLUS how to maintain the filters for extended component life and reduced machine wear.
- How to safely and effectively repair and pre-charge an accumulator for maximum speed and shock absorption.
- The six main causes of solenoid failure.
- How to troubleshoot the pressure reducing valve.
- Two quick checks to verify an accumulator is operating properly.
- How to test directional valves for bypassing.
- Four-step safety procedure that MUST be followed before charging, discharging and removing an accumulator prior to working on the machine.
- The 10 most common causes of leaks and how to get rid of them once and for all.
- The right and wrong methods for increasing the speed of the machine.
- The three factors that determine the flow through a flow control and how they affect the speed of the cylinder or motor.
- How to verify that a cylinder or motor is bad BEFORE it is changed.
- Four critical visual checks to make when initiating a hydraulic problem.
- Step-by-step instructions for troubleshooting fixed and variable displacement pumps.
- How to test a cylinder for excessive leakage.
- The best method for diagnosing check valve failures.

# Companies That Have Benefited From This Training

Alcoa  
 American Crystal Sugar Company  
 Anthony Forest Products  
 Arch Coal  
 Boise Cascade  
 Bowling Green Metalforming  
 Bradford Forest  
 Century Aluminum  
 Clearwater Paper  
 Continental Structural Plastics  
 DAK Americas  
 Del-Tin Fiber  
 Domtar Paper  
 Duer Carolina Coil  
 Easley Custom Plastics  
 ExxonMobil  
 Flakeboard America  
 Flambeau Inc.  
 GAF  
 Georgia-Pacific  
 General Motors  
 Goodyear Tire and Rubber  
 Grain Processing Corporation  
 Graphic Packaging Corporation  
 Haynes International

Hood Industries  
 Imperial Sugar Company  
 International Paper  
 JS Steel  
 Kapstone Paper  
 Kimberly Clark  
 McKechnie Vehicle Components  
 Medegen Medical Products  
 NASA Marshall Space Center  
 Nike IHM  
 Nissan  
 Novelis  
 Nucor Steel  
 Packaging Corporation of America  
 Pratt Industries  
 Resolute Forest Products  
 Sappi Fine Paper  
 Shaw Industries  
 Sherwin Alumina Company  
 Shurtape  
 SunCoke  
 The HON Company  
 WestRock  
 Weyerhaeuser



## Onsite Training

Need to train your team, but it has always been too expensive? More and more companies are realizing the value of bringing training onsite. This flexible and cost-effective option allows you to train as many employees as desired. The benefits of onsite training are obvious and rewarding:

- > Tailored curriculum to address your company's needs in a more personable, intimate setting
- > Reduce travel expenses, time away from the plant, downtime and scheduling disruptions
- > Confidential company issues and solutions may be discussed freely onsite
- > Strong team-building opportunities
- > Cost-effective return on investment

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# Hydraulic Troubleshooting Registration Form

## 4 Ways To Register



Go Online  
**Noria.com**



Call toll-free  
800-597-5460 or  
918-749-1400



Mail the  
registration form!



Fax your registration  
918-746-0925

**Course Fees: \$1,295**

### TRAINING COURSE

Course City: \_\_\_\_\_

### WHO WILL BE ATTENDING

Mr./Ms.: \_\_\_\_\_

Job Title: \_\_\_\_\_

E-mail: \_\_\_\_\_

*(Please list additional registrations on a separate sheet and attach)*

### COMPANY INFORMATION

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Mail Stop: \_\_\_\_\_

City: \_\_\_\_\_ State/Province: \_\_\_\_\_

Country: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

### METHOD OF PAYMENT

Payment is due prior to course

Check enclosed

Make check payable to:

Noria Corporation

Mail to:

Noria Corporation

ATTN: Training

1328 East 43rd Court

Tulsa, OK 74105

Charge to:



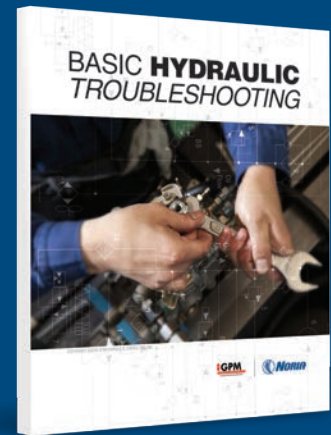
Card Number: \_\_\_\_\_

Expiration Date: \_\_\_\_\_

Name on Card: \_\_\_\_\_

Signature: \_\_\_\_\_

Our Purchase Order is attached.  
P.O.# \_\_\_\_\_



## What You Get When You Attend

The fully-illustrated color workshop manual contains more than 300 pages of troubleshooting and reliability procedures. After the training you'll use this valuable resource as a reference as actual machine problems occur.

## 2016 Dates & Locations

### July 19-21 Minneapolis, MN

DoubleTree Minneapolis Park Place  
1500 Park Place Blvd.  
Minneapolis, MN 55416  
**952-542-8600**

### Registration Information

Check-in: Tuesday, 7:30 a.m. – 8:00 a.m.

Program: Tuesday – Thursday, 8:00 a.m. – 4:00 p.m.

The fee is \$1,295 per person. For fast registration, call 800-597-5460 toll-free between 8 a.m. and 5 p.m. central time Monday through Friday. Or, fax your registration form to 918-746-0925 at any time. The fax line is open 24 hours a day, seven days a week. We will send a confirmation of your registration via e-mail. If your confirmation does not arrive within 48 hours, please contact us to process your registration immediately. In lieu of cash, check and credit cards are preferred when paying at the training site.

### What's Included

Your fee provides you the best training available, a comprehensive manual, and a free package of training materials.

### Cancellations And Substitutions

If your plans change and you cannot attend the course, a colleague can attend in your place. Registrations canceled at any time prior to 10 days before the course are not subject to any fee. Cancellations after that time are subject to a \$75 service charge. Or, your registration fee can be transferred to another program of your choice to be taken within 12 months. Visit [noria.com/train/registration](http://noria.com/train/registration) for the complete cancellation and transfer policy.