

HYDRAULICS AND SYSTEM TROUBLESHOOTING

CLASS FORMAT:

Lab + classroom

The participant is able to “learn-by-doing” in the course; this knowledge can be transferred to the workplace.

STANDARD CLASS SIZE:

NTT recommends a class of 12 participants to obtain the best results.

NTT TO PROVIDE:

- 4-days (32 contact hours) of on-site instruction
- Textbooks and lab manuals,
- Classroom consumables
- Completion certificates
- Shipping, instructor fees and travel expenses

CLIENT TO PROVIDE:

- Classroom, with easy access, of 750 square feet or greater
- Projection screen, white board and/or flip chart(s)
- A dock facility or a forklift to unload the training equipment
- A pallet jack to move the crates around after they have been unloaded may also be needed
- The equipment should be placed in the training room for the NTT instructor to test and set up prior to the start of training

SHIPPING:

3 crates:

- 2 crates @ 38" x 52" x 81" (1,150 lbs. each)
- 1 crate @ 38x58x57 (750 lbs., cavitation unit)

Learn the basic hydraulic components, how they work, and their function in a hydraulic circuit. You will be able to understand and interpret hydraulic schematics, and implement safe work practices.

The extreme flexibility of hydraulic elements can create a number of problems. Participants learn how fluids must be positively confined through the entire system and prevented from going anywhere except where we want them to go.

There is no magical way to troubleshoot a hydraulic system; it is the logical analysis of basic facts and principles. Through the hands-on hydraulic trainers you will construct, operate and troubleshoot systems using common hydraulic components.

COURSE AGENDA

HYDRAULIC PRINCIPLES

- Pressure and force
- Advantages and disadvantages
- Physical properties of liquids
- Measurement and scales
- Pascal's Law
- Horsepower and torque

HYDRAULIC PUMPS

- Positive-displacement of pumps
- Increasing/decreasing volume
- Gear/van piston/screw pumps
- Troubleshooting cavitation, entrained air, effects of varnish and sludge

FLOW, PRESSURE AND DIRECTIONAL CONTROL VALVES

- Flow controls, actuator speed, and orifices
- Hydraulic circuit/placement
- Relief/sequence/counterbalance valves
- Pressure-reducing valves
- 3-position directional valve symbols
- Solenoids-controlled, pilot-operated valves
- Measuring surge pressure

HYDRAULIC CYLINDERS

- Single and double acting cylinders
- Seals
- Cylinder types and construction
- Flow required by cylinders
- Regenerative circuit
- Troubleshooting cylinders



HYDRAULICS AND SYSTEM TROUBLESHOOTING

COURSE AGENDA, continued

HYDRAULIC MOTORS

- Speed and torque
- Types and sizing of hydraulic motors
- Hydraulic motors in circuits
- Hydrostatic transmission
- Applications of rotary actuators

ACCUMULATORS

- Applications, sizing, and charging
- Installation and operating instructions
- Gas precharge pressure

HYDRAULIC FLUIDS

- Properties and types fluids
- Fire-resistant/biodegradable fluids
- Fluid storage and handling

FLUID CONDUCTORS

- Hydraulic fluid conductors
- Steel pipes and tubes
- Flexible hose
- Fluid velocities
- Friction/restrictions in fluid lines

RESERVOIRS, HEAT EXCHANGERS AND FILTERS

- Contamination control
- Detection

TROUBLESHOOTING—BASIC REQUIREMENTS

- Component function and operation
- Hydraulic symbols

PRINCIPLES OF MOTION AND FORCE

- Movement and speed—flow rate
- Flow pressure

SOME GENERALIZATIONS

- New vs. old systems
- The major cause of failure
- Diagnostic equipment

NOISY PUMPS OR CAVITATION AND AERATION

- Low pressure/entrained air
- Vacuum, foaming, and air leaks

LOW, ERRATIC OR NO PRESSURE

- Wrong rotation of pump
- Relief valve or compensator
- Low reservoir level

CONTAMINATION IN VALVES NO MOVEMENT OF ACTUATOR

- Malfunctioning pumps
- Lack of pilot pressure
- Incorrect plumbing connections
- Solenoid problems
- Wrong temperature or motor speed

NOISE CONTROL

- Lower noise generation
- Isolating noise

CYLINDER & CIRCUIT PROBLEMS

- Erratic or jerk motion
- Blown rod seals, cylinders, or plumbing
- Cylinder drift

SOLENOID FAILURE

- Coil burnout
- Mechanical destruction
- Life expectancy

LEAKAGE CONTROL

- Flare type fittings
- Straight and tapered threads
- O-ring failures

TROUBLESHOOTING GUIDE

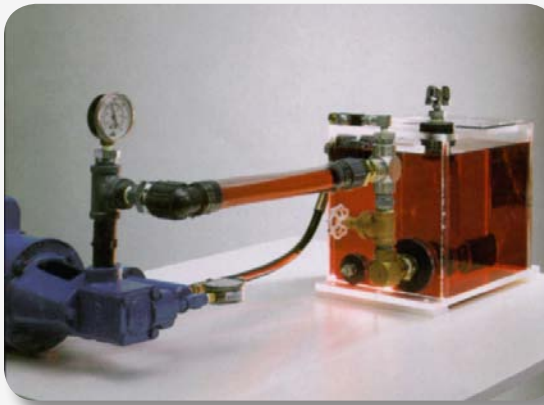
- Test set up and procedures
- Fixed displacement motor
- Variable displacement pump

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COURSE AGENDA, continued

HANDS-ON LAB EXERCISES

- NTT trainer familiarization
- Flow control types
- Meter-in flow control
- Meter-out flow control
- Bleed-off flow control
- Two-speed control
- Sequencing circuit
- Sequencing with flow control
- Remote pilot of sequence valve
- Pressure reducing with sequencing
- Pilot-operated relief
- Regeneration
- Differential volume



Participants see first-hand how problems such as cavitation, aeration, erratic pressure, loss of pressure or flow shorten component life and influence system failures.



Using NTT's specially developed hands-on training stations, participants build and operate no fewer than 14 different circuits.