

# Hydraulic Specialist Certification

## WHAT YOU NEED TO KNOW

Hydraulic Specialist (HS) Certification defines professional standards for those responsible for analyzing, troubleshooting systems, designing systems, and selecting components. In-depth knowledge in the following areas is necessary to be successful in obtaining an HS Certification.

### Understand The Function Of Hydraulic Components In Circuits

- Use hydraulic symbols.
- Recognize hydraulic symbols.
- Understand circuit diagrams and component functions.
  - Read circuit diagrams.
  - Understand the application of pumps and intensifiers.
  - Understand the application of valves.
  - Understand the application of actuators.
  - Understand the application of regenerative circuits.
  - Understand the application of accumulators.
  - Understand the application of fluids.
  - Understand the application of fluid conditioning.
  - Understand the application of connectors and conductors.
  - Understand the application of a prime mover.
  - Understand the application of hydrostatic systems.
  - Understand the application of steering.
- Select the proper formulae to calculate force, torque and speed.
- Perform load calculations.
  - Understand linear load and motion parameters.
  - Understand the principles of pulley systems.
  - Understand the principles of levers.
  - Understand rotary load and motion parameters (solve for T).
  - Understand the principles of gearing.
- Determine the work profile to move loads (force, distance, work, torque, speed, velocity, and power).
  - Calculate the work profiles of a hydraulic system.

### Selecting Components For Hydraulic Systems

- Specify hydraulic cylinders.
  - Use the proper formula to size cylinders.
  - Calculate the reaction force on a cylinder rod bearing.
  - Understand the importance of rod column strength.
  - Calculate the thrust for a toggle mechanism.
  - Calculate the hydraulic pressure to support jib boom loads.

### Analyze Loads And Motion

- Identify system parameters (linear and rotary).

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- Specify hydraulic motors.
  - Calculate torque, speed, and horsepower of hydraulic motors.
  - Understand break away, running and starting torque.
  - Understand shaft torque and mounting capacity.
  - Understand radial and axial load limitations.
  - Understand speed requirements and limitations.
  - Calculate efficiencies.
- Specify hydraulic pumps.
  - Calculate pump size for required flows.
  - Understand inlet conditions.
  - Understand speed requirements and limitations.
  - Understand direction of rotation.
  - Understand pressure capabilities.
- Specify hydraulic valves.
  - Understand the selection process of a pressure control valve.
  - Understand the selection process of a directional control valve.
  - Understand the application of logic elements (cartridge valves).
- Specify hydraulic reservoirs.
  - Calculate the capacity of a reservoir using volume requirements.
  - Understand the limitations of the reservoir for fluid conditioning.
- Understand the requirements of a properly designed reservoir.
- Specify hydraulic accumulators.
  - Understand the difference between isothermal and adiabatic conditions.
  - Understand the purposes of the accumulator.
- Specify hydraulic intensifiers.
  - Calculate intensifier ratio for given pressure and flow.
- Specify fluid conductors.
  - Calculate the size of fluid conductors given a velocity and flow.
  - Understand safety factors for fluid conductors.
- Specify heat exchangers.
  - Calculate the head load.
  - Understand the effects of hydraulic pressure loss and temperature change.



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- Confirm system fluid compatibility.
  - Ensure temperature and viscosity compatibility.
  - Ensure component compatibility.
- Determine the required fluid cleanliness level of the system.
  - Select filter type and location.
  - Specify means for proper fluid sampling.

### Analyze And Troubleshoot Hydraulic Systems

- Interpret diagnostic readings (pressure, flow, heat, vibration, noise, and cycle times).
  - Identify troubleshooting parameters.
- During start-up of a new, recently repaired or modified system, verify the proper selection, installation, and operation of components.
  - Verify completion of start-up check list.
  - Verify correct component selection.
  - Verify correct component connections.
  - Verify correct component operation.
  - Analyze circuit design.
- On non-performing systems, verify the proper operation of components by isolating functions in branch circuits.
  - Trace the operational sequence of a circuit.
  - Distinguish between correct and incorrect operation of components.
- Interpret fluid analysis reports for machines.
  - Identify contaminants in a hydraulic fluid analysis.

### Electrohydraulic Control Systems

- Understand electronic control fundamentals for hydraulic systems.
  - Familiarization with control system requirements.
  - Familiarization with ladder logic diagrams, function block and structured text.
  - Familiarization with digital communication technology.
  - Understand the operation of proportional valves.
  - Understand the application of proportional valves.
  - Understand the application of sensors.
  - Identify components on the amplifier card.



The International Fluid Power Society (IFPS) believes that implementation of safe procedures is paramount in all fluid power systems, the electrical and electronic controls that guide them, and all associated technologies. The IFPS recommends that, in every circumstance, factory, piece of mobile equipment, or application of any fluid power product or its controls, every employee and employer is responsible to know, understand, and practice the safety policies and procedures already in place. Consult manufacturer's safety specifications for each machine. Take the responsibility to improve the safety standards whenever an opportunity presents itself. No one knows the equipment better than the people who work with it daily – they are the most important ones to improve that equipment's safety.