Multi-State
Advanced Manufacturing
Consortium

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MSAMC Master Performance Based Objectives (PBO) Review Template

Instructions

The following tab lists PBOs for the topic area ***Hydraulics*** . Please review each of the PBOs, and rate each PBO with one of the following ratings:

1 = Skill or understanding is required for employees.
2 = Skill is useful, but is not crucial for employees.
3 = Skill is not useful for employees, or isn't relevant for typical work assignments.
0 = PBO is unclear.

Additionally, for each PBO, note any comments or recommendations that you may have about how to improve the PBO. If any PBOs or skill sets seem to be missing from the list, please add them in the space at the bottom of the list.

Please enter your information below	
Name:	
Company/Plant:	
Department/Division:	
Industry/Segment:	
Email:	
Phone:	

Hydraulics

M-S AMC Industry Partner PBO Review

Please review the following PBOs to identify the appropriate skill set for a given job title / category / classification (see row 10 below).

* In the "**Importance**" column, identify how important each PBO is for someone in the relevant position. For each PBO, type 1 if the PBO must be covered in the coursework, enter 2 if the PBO is helpful but not necessary and would not impair the performance of the employee in the workplace if missed, and enter 3 if the PBO would not benefit the student or doesn't apply to the typical work assignments. If you don't understand the PBO, enter 0.

* Note any comments or feedback for improving each PBO (in the "Comments" column).

Note: It is the intention of competency based instruction to have each student individually demonstrate their proficiency of the skills indicated.

Reviewing PBOs fc ***TYPE JOB TITLE HERE*** (from whose perspective are you rating PBO importance?)

Sub-Topic	Level	Topic	PBO ID	Performance Based Objective (PBO)	Importance 1 = Need 2 = nice to have 3 = N/A 0= Don't understand	Comments *Notes to improve the PBO, PBO is unclear, etc.*
	1	HD	1	Apply safe working practices when working with hydraulic systems.		
	1	HD	2	Identify the schematic symbols for the components of an industrial hydraulic system.		
	1	HD	3	Match the function of the components of an industrial hydraulic system with proper description of their function and their symbol.		
	1	HD	4	Match typical hydraulic circuits used in industry with proper description. (Written exercise)		
	1	HD	5	Define the terms: pressure, flow, force, velocity, horsepower, torque, watts and current as they relate to a pump motor system.		
	1	HD	7	Identify the types, properties, and functions of hydraulic fluid that make power transmission possible.		
	1	HD	6	Use Pascal's Law to determine the pressure and flow at any given point in a simple hydraulic system. Calculate the actual flow rate and the volumetric efficiency. Calculate force, temperature, velocity, horsepower, rate, and torque relevant to an existing machine, and convert results to specific units of measure.		
	1	HD	10	Match Pump types to a description of their working principles.		
	1	HD	11	Match symptoms of pump/tank malfunction, such as cavitation, aeration, and overheating with likely causes.		
	1	HD	12	Using the training simulator, perform the lab procedure to demonstrate the phenomenon of pump cavitation.		
	1	HD	13	Using the training simulator, perform the lab procedure to demonstrate pump pseudo-cavitation or aeration.		
	1	HD	14	List causes of system inefficiencies associated with fixed volume pumps.		
	1	HD	15	List applications for variable volume pumps.		
	1	HD	16	Using the training simulator, determine the flow rate developed by the pump.		
	1	HD	17	Identify the components of a hydraulic reservoir and describe their functions.		

	1	HD	8	List sources of fluid contamination and ways to avoid contamination.		
	1	HD	9	Using product literature and internet researched material, list the details to correctly maintain hydraulic power units (fixed / variable pumps, reservoirs, filters, strainers and gauges (includes P.M. considerations)		
	1	HD	18	Match the following Pressure control valves with their symbol and their applications: - Relief (direct operating and pilot operated) - Two-stage relief - Pressure reducing - Sequence - Unloading & counterbalance		
	1	HD	19	Identify the type of drains associated with each type of pressure control valve.		
	1	HD	23	Using the training simulator, set the maximum system pressure by adjusting the pressure relief valve.		
	1	HD	34	Sketch a circuit that reflects bypass filtration.		
	1	HD	20	Write a description of the operation of a direct-acting poppet type pressure control valve.		
	1	HD	21	Match Direction Control valves & types of spools (center condition) (including pilots and operators) with their symbols and their applications.		
	1	HD	36	Label the ports on a directional control valve.		
	1	HD	37	Trace the various flow paths through the directional control valve using a system schematic.		
	1	HD	38	List centering conditions commonly used in directional control valves.		
	1	HD	39	List piloting arrangements commonly used with directional control valves and sketch the symbols.		
	1	HD	40	List the different kinds of directional control valve configurations that can be used to control the operation of a hydraulic cylinder using a system schematic.		
	1	HD	22	Match flow controls (uncompensated, temperature compensated, and pressure compensated) with a description of their operation and symbol.		
	1	HD	24	Using the training simulator, connect a normally open (passing) pressure reducing valve with gage to trainer's pressure and drain ports on the header. Adjust and monitor valves operation.		
	1	HD	26	Using the training simulator, connect a normally closed (non-passing) sequence valve to a flow control valve(s), gage, pressure, and drain header to achieve prescribed sequencing of multiple cylinders .		
	1	HD	27	Match the components and operation to direct-acting, pilot operated and normally open pressure control valves.		
	1	HD	28	Using the training simulator, set the flow rate through the use of a pressure compensated flow control valve. Apply metering adjustments to a cylinder circuit to control the timing of cylinder extend and retract functions.		

	1	HD	29	Using the training simulator, construct a circuit using a flow control valve to meter out a cylinder as it extends. As the cylinder extends, observe the pressure changes at the rod end of the cylinder. Vary the system pressure and record the pressure at the rod end of the cylinder during extension.		
	1	HD	30	Using the training simulator, design a circuit using a flow control valve to bleed off a portion of the pump's flow. Apply this design to control a cylinder's rate of extension and retraction.		
	1	HD	31	Using the training simulator, construct a circuit to extend and return a cylinder with the same time using a regenerative circuit.		
	1	HD	32	Construct a circuit to demonstrate a counterbalance operation.		
	1	HD	33	From the symbol, identify the flow direction of a check valve.		
	1	HD	25	Using the training simulator, build a circuit with a pressure reducing valve, so that a cylinder will extend at a pressure which is lower than the relief valve setting.		
	1	HD	42	Label the functions of ports on a flow control valve.		
	1	HD	43	Apply metering adjustments to a cylinder circuit to control the timing of cylinder extend and retract functions.		
	1	HD	44	Write a description of the operation of a pressure-compensated flow control valve, and trace the path of the fluid through the valve.		
	1	HD	45	Write a description of the operation of a check valve.		
	1	HD	46	Write a description for the application of an accumulator in a system.		
	1	HD	47	List common types of accumulators.		
	1	HD	48	Identify the procedure and safety considerations for depressurizing and pre-charging a gas filled bladder type accumulator.		
	1	HD	50	Demonstrate the adjustment and operation of Cylinder cushions.		
	1	HD	51	Demonstrate the use of unloading valves to relieve system pressure when not needed.		
	1	HD	52	Using the training simulator, construct a circuit to control the shaft speed of a hydraulic motor. Monitor the shaft rpm under varying loads. Demonstrate both meter in and meter out techniques.		
	1	HD	53	Match various types of actuators (cylinders & motors) with their proper description and symbol.		
	1	HD	54	List the conditions that affect flow in a hydraulic system using a system schematic.		
	1	HD	55	Match the correct tubing, hosing, and fittings to specific hydraulic applications.		
	1	HD	56	Match the piping schedule to the expected system pressure used.		
	2	HD	57	Match the symbol and function to servo and proportional valves.		
	2	HD	58	Write a description of the operation of a hydrostatic drive circuit using a schematic. Describe the function of the components and the flow path through the circuit.		

	2	HD	59	Given the results of an oil analysis, identify the most probable causes for any poor ratings.		
	1	HD	66	Identify and list the four basic types of hydraulic fluids, giving the advantages and disadvantages for each.		
	1	HD	60	Troubleshoot using hydraulic circuit drawings and fault-finding charts as a systematic aid to fault-finding.		
	1	HD	61	Given plant working drawings (with and without manifolds) and the state of all directional control operators, draw all paths for fluid flow and predict the circuit response associated with all adjustments and solenoid actuation.		
	1	HD	62	Troubleshoot hydraulic circuits using hydraulic test equipment to determine the nature and origin of faults.		
	2	HD	63	Disassemble, rebuild, and reassemble selected fluid power components.		
	1	HD	64	Calculate head pressure.		
	1	HD	65	Define viscosity and identify typical SUS ratings of hydraulic fluids.		

Additions: Please add any additional objectives that we may have overlooked.

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