



Multi-State Advanced Manufacturing Consortium

US DOL SPONSORED TAACCCT GRANT: TC23767

MSAMC Master Performance Based Objectives (PBO) Review Template

Instructions

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

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

Additionally, for each PBO please

- * Note any comments or recommendations that you may have about how to improve the PBO.
- * Indicate whether each PBO is covered in your college's aligned courses, and how (written, lab demo, exercise).

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:	
Institution:	
Date:	
Email:	
Phone:	

20150622_pbo_review_acad_hydraulics

found in [Resources](#)

by the M-SAMC Multi-State Advanced Manufacturing Consortium

www.msamc.org

is licensed under a

[Creative Commons Attribution 4.0 International License](#).



Hydraulics

M-S AMC Academic Partner PBO Review

Please enter your information below

Name:	
Institution:	
Date:	
Email:	
Phone:	

Please indicate which course or courses delivered at your institution align with, or cover, the listed objective

Aligned Course(s)	1	<i>Enter course code here</i>
	2	<i>Enter course code here</i>
	3	<i>Enter course code here</i>

*** Note:** For each covered PBO, indicate in which of the aligned courses, documented at left, the PBO would be most extensively covered. If there is only one course listed to the left, then you do not have to complete the "Aligned Course" column.

Sub-Topic	Level	Topic	PBO ID	Performance Based Objective (PBO)	Importance, 1 = Need 2 = Nice to have 3 = N/A 0 = Don't understand	Covered - Written Assignment / Reading?	Covered - Exercise or Assessment?	Aligned Course *	Comments <i>Notes to improve the PBO, PBO is unclear, lacking equipment to cover, etc.</i>
						Y/N	Y/N		
	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,					
	1	HD	12	Using the training simulator, perform the lab					
	1	HD	13	Using the training simulator, perform the lab					
	1	HD	14	List causes of system inefficiencies associated					
	1	HD	15	List applications for variable volume pumps.					
	1	HD	16	Using the training simulator, determine the flow					
	1	HD	17	Identify the components of a hydraulic reservoir					
	1	HD	8	List sources of fluid contamination and ways to					
	1	HD	9	Using product literature and internet researched					
	1	HD	18	Match the following Pressure control valves with					
	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					
	1	HD	34	Sketch a circuit that reflects bypass filtration.					
	1	HD	20	Write a description of the operation of a direct-					
	1	HD	21	Match Direction Control valves & types of spools					
	1	HD	36	Label the ports on a directional control valve.					
	1	HD	37	Trace the various flow paths through the					
	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					
	1	HD	64	Calculate head pressure.					
	1	HD	65	Define viscosity and identify typical SUS ratings					

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



SAFETY DISCLAIMER:

M-SAMC educational resources are in no way meant to be a substitute for occupational safety and health standards. No guarantee is made to resource thoroughness, statutory or regulatory compliance, and related media may depict situations that are not in compliance with OSHA and other safety requirements. It is the responsibility of educators/employers and their students/employees, or anybody using our resources, to comply fully with all pertinent OSHA, and any other, rules and regulations in any jurisdiction in which they learn/work. M-SAMC will not be liable for any damages or other claims and demands arising out of the use of these educational resources. By using these resources, the user releases the Multi-State Advanced Manufacturing Consortium and participating educational institutions and their respective Boards, individual trustees, employees, contractors, and sub-contractors from any liability for injuries resulting from the use of the educational resources.

DOL DISCLAIMER:

This product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

RELEVANCY REMINDER:

M-SAMC resources reflect a shared understanding of grant partners at the time of development. In keeping with our industry and college partner requirements, our products are continuously improved. Updated versions of our work can be found here:
<http://www.msamc.org/resources.html>.

[20150622_pbo_review_acad_hydraulics](#)

found in [Resources](#)

by the M-SAMC Multi-State Advanced Manufacturing Consortium

www.msamc.org

is licensed under a

[Creative Commons Attribution 4.0 International License](#).

