Lab 8 System Operational Relationships

Group 7

Xinyu Liu

Xinhao Liu

Haijia Tang

Indentured Equipment List

NO	Major Subsystem	Dominant Component	Function	Subordinate Component	Function	Energy Source	Phase	Interface		
								Hardware	Software	Human
1	Control System	Control Panel	The entire system is controlled and monitored for operational status and real-time performance.	Pressure Switch	Control the pressure at certain range	Mechanical	Automatic Sequential	Hardware:Control Line Software:Pressure Human:Turn on/off		
				Display Screen	Ensure that the control panel controls the fire pump and receives information from the fire pump components for adjustment and control.	Electricity	Automatic Simultaneous	Hardware:Control Panel, Screen Software:Information System Human:Watching, turning on off		
		Battery	Provides a stable power supply to the entire installation.	Power source	Provide energy	Chemical	Automatic Simultaneous	Hardware: Battery Software:Voltage Human:Maintaince		
				Backup Battery	Ensure power in dangerous situation	Electricity	Automatic Simultaneous	Hardware:battery Software:Current, Voltage Human:Maintaince		
		Diesel Fuel Supply	Fuel supply system provides fuel to the entire system	Supply Valve	Control the open or close of the fuel	Mechanical	Manual Sequential	Hardware:Valve Software:Controling mechanism Human:Maintaince		
				Indicator	Show the system situation of the fule	Mechanical	Automatic Simultaneous	Hardware:Electric Line Software:On/off signal Human:Maintaince, Illustration		
				Supply Pipeline	Supply the fuel	Mechanical	Manual Sequential	Hardware:Pipe Line Software: Friction Human:Maintaince		
2	Pump System	Jockey Pump	A jockey pump is a small pump connected to a fire sprinkler system to maintain pressure in the sprinkler pipes. This is to ensure that if a fire-sprinkler is activated, there will be a pressure drop, which will be sensed by the fire pumps automatic controller, which will cause the fire pump to start.	Power source	Provide the propulsion energy	Electricity	Automatic Simultaneous	Hardware:battery Software:Current Human:none		
				Pressure indicator control	Display the pressure	Electricity	Automatic Simultaneous	Hardware:Control valve Software:Control Signal Human:Worker operation		
4		Discharge Manifold	Drainage of water from the system during the testing phase	Discharge Manifold	Discharges fluid to a common, continuous discharge manifold after drawing fluid from an inlet port.	Mechanical	Automatic Sequential	Hardware:manifold Software:Discharge signal Human:worker operation		
				crankshaft	Its purpose is to convert reciprocating motion into rotary	Mechanical	Automatic Sequential	Hardware:Camshaft Software:Control Signal		

				crankshaft	reciprocating motion into rotary motion in a piston engine.	Mechanical	Automatic Sequential	Software:Control Signal Human:Operation
		Engine	Provide power and energy for fire pumps	Starter	used to rotate (crank) internal combustion engines so that they can start working on their own.	Mechanical / Electricity	Manual Sequential	Hardware:Starter trigger Software:Control Signal Human:initiation operation
				Alternator	Charge battery so that other electrical components can be powered.	Mechanical / Electricity	Automatic Sequential	Hardware:Alternating machine Software:Control Signal Human:Operation
5	Energy System			Fuel pump	The fuel pump draws petrol from the tank through a pipe into the engine's reaction zone, where a chemical reaction takes place, converting chemical energy into mechanical energy.	Mechanical	Automatic Sequential	Hardware:Pump Software:Control Signal Human:Pump parameter setting
		Electric Motor	The motor converts electrical energy into mechanical energy to provide the working energy for the fire pump.	Motor coils and magnets	Conversion of electrical energy into mechanical energy by means of magnetic field conversion.	Magnetic	Automatic Sequential	Hardware:Magnet Software: Human
				Copper wire	Acts as a carrier of electrical energy to the system.	Physical	Automatic Sequential	Hardware:Any connecting part Software:Current and voltage Human:Maintaince
				Alternator	An alternator is a generator that converts mechanical energy into electrical energy in the form of alternating current	Mechanical / Electricity	Automatic Sequential	Hardware:With the working mode Software:Control Signal Human:Maintance
				Shaft	Converting electrical energy from motors into mechanical power.	Mechanical	Automatic Sequential	Hardware:shaft Software:Control Signal, Voltage, Current Human:No human involvement
6	Other System	Test line	Test whether the function of the fire pump is normal	Test valve	For inspection usage	Mechanical	Manual Sequential	Hardware:Valve Software:Control Signal Human:Maintaince
				test header	It provides a method for the flow test of fire pump	**NG**	**manual,sequential,test**	**Hardware: Software:parameter controler Human:Maintaince**
				special nozzle	Connect the hose to drain the fire pump	**NG**	**manual,sequential,fixed**	**Hardware: Nozzel Software:NG Human:Maintaince**
				hose	Connection of fire pumps and nozzles to deliver water throughout the system for testing	**NG**	**manual,sequential,fixed**	**Hardware:hose Software:NG Human:Maintaince**

Time	Test Valve	Bypass Loop	Calibrator Cage	Discharge	Suction	Motor	Jockey Pump	Control Panel
0.00								
2.00								
2.30								
5.30								
6.00								
9.00								
11.00								
12.00								
12.30								
15.30								
17.00								
20.00								
21.00								
23.00								
25.00								
30.00