

TEST PROJECT PNEUMATIC ENGINEERING

ESNC2019_TP





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INTRODUCTION

The Pneumatic Engineering competition intends to cover the basic skills of pneumatic engineering processes and its main components such as pneumatic technology, electro-pneumatic technology, Using LOGO (PLC) programming, troubleshooting, maintenance, simulation and optimization. The test project is designed to assure an objective evaluation of all test project components that are used on real job sites of industrial automation processes. Test Project is split into six main modules and they are partially dependent. Further, in order to ensure sustainable development of this skill in the future, use of common parts and equipment pursued in the Test Project. Test Project is also designed to give quick visual understanding to visitors and related parties of Emirates Skills members attracting their interests and attentions so that it helps them understand how important the mechatronics skill is.

DESCRIPTION OF PROJECT AND TASKS

Competency and Scope of Work:

The competition is a demonstration and assessment of the competencies associated with this skill. The test project consists of hands on and knowledge skills that master and reflect the full implementation of the Pneumatic, electro pneumatic, programmable logic controllers (PLC)-(LOGO module will be used).



Competitors have to carry out independently the following tasks:

- Using Fluid-SIM software to design, construct, evaluate and simulate the required pneumatic circuit.
- Using the pneumatic workstation to build and operate the required pneumatic circuit
- Troubleshooting of the required pneumatics circuit/ pneumatics circuit with LOGO.
- Using Fluid-SIM software to design, construct, evaluate and simulate the required electro pneumatic circuit.
- Using the pneumatic workstation to build and operate the required electro pneumatic circuit
- Interfacing, building and connecting electro-pneumatic circuit to the LOGO-Logic Module
- Using LOGO-software to write the required program either using Ladder logic or FBD language
- Understand the professional practice of the work being done.
- Understanding the function of all components



Description of Project and Tasks:

Test Project of Mechatronics is composed of four tasks in total, jobs included in each task:

Task number	Time required (hours)	Time	Day
Task-1	Pneumatics – short sequence	2.0 hours	1
Task-2	Pneumatics – Long sequence	1.0 hour	
Task-3	Troubleshooting (Time factor)	2.0 hours (cover all teams) -(30 min/team)	
Task-4	Challenge Task	1.0 hour	
Task-5	Electro-pneumatics-short sequence	2.0 hours	2
Task-6	Electro-pneumatics-long sequence	1.0 hours	
Task-7	LOGO module – short sequence	2.0 hours	
Task-8	Challenge Task	1.0 hour	
Task-8	LOGO module – long sequence	3.0 hours	3
Task-9	Troubleshooting (Time factor)	3.0 hours	



Section 3

Day-1-Task 1-Pneumatics.

(2 hours)

The Competitors have to carry out the following by (using Fluid-SIM and Pneumatic Work Station).

- Design, Draw and simulate pneumatic circuit using fluid-SIM software for the following Sequence.

A+ Delay B+ A- B-

- ❖ According to the following conditions:

- Single cycle operation
- Continues cycle operation
- Delay forward stroke B+ with 2 second
- Control the speed of forward strokes A+ and B+.

- Build pneumatic circuit by using pneumatic workstation:
- Placing the required pneumatic valves and other actuators
- Connecting all components according to the pneumatic circuit diagram
- Checking the circuit against any air leakage
- Operating the circuit achieving the required sequences with the required conditions
- Professional Practice

Day-1-Task 2-Pneumatics (using Fluid-SIM only).

(1 hour)

- Design, Draw and simulate pneumatic circuit using fluid-SIM software for the following sequence.

B- A+ B+ A- B- B+

- ❖ According to the following condition:

- One cycle operation
- Continues cycle
- Do not use ready block in the fluid sim software for example stepper, shift register.
- The competitors have to use directional control valves only.



Day-1-Task 3-Troubleshooting of pneumatic circuit.

(2 hours)

The chief expert and experts will create 6 faults on the previous pneumatics circuit which you did in the first task. Each team has to find these faults and operate the pneumatic circuit correctly according to the given sequence in task-1, **A+ B+ A- B-**

Note:

- 1- The faults may be on the fluid-sim software or pneumatic circuit on the work station.
- 2- If any team operates the correct sequence (for example rebuild the circuit again without Finding. The faults and repair them) will take marks for the correct sequence only.

Fault	Done		Where the fault in the pneumatic circuit?	Comments
	Yes	No		

Correct sequence	Team Sequence	
	Yes	No
A+		
B+		
A-		
B-		

Starting time: _____ Ending time: _____

Time taken: _____

Day-1-Task 4-Challenge task

(1 hours)

The committee will decide the type of required challenge task (pneumatics/electro-pneumatics/LOGO) where the competitors must do it.



Day-2-Task 5—Electro-pneumatics

The Competitors have to carry out the following by (using Fluid-SIM and Pneumatic Work Station).

➤ Design, Draw and simulate electro-pneumatic circuit using fluid-SIM software for the following Sequence **A+ B+ A- B-**

➤ **According to the following conditions:**

- ❖ Single cycle operation
- ❖ Continues cycle operation
- ❖ Use limit switches, and Photo sensor.
- ❖ Control the speed of forward strokes A+ and B+.

- ❖ Build pneumatic circuit by using pneumatic workstation.
- ❖ Placing and connecting all electro-pneumatic components according to the circuit diagram.
- ❖ Checking the circuit against any air leakage.
- ❖ Connecting the circuit power supply.
- ❖ Checking the circuit against any short circuit connection.
- ❖ Operating the circuit achieving the required sequences.
- ❖ Professional Practice.

Day-2-Task 6—Electro-pneumatics (using Fluid-SIM only)

(1 hours)

➤ Drawing and simulating the circuit using fluid-SIM software for the following sequence

B- A+ B+ A- B- B+

➤ **According to the following conditions:**

- ❖ One cycle operation.
- ❖ Continuous cycle
- ❖ Adding some features for example emergency switch.



Day-2-Task 7-LOGO module

(2 hours)

LOGO module and Logo-soft comfort software:

- Write the suitable program to operate the following electro-pneumatic circuit with the following Sequence A+ B+ A- B- functionality using PLC-LOGO module and LOGO soft comfort software.
 - **Under the following condition:**
 - ❖ Operate single cycle.
 - ❖ Operate continues cycle (4 times).
 - ❖ Before starting the sequence, Red lamp ON.
 - ❖ At the end of the cycle, the buzzer will buzz for 3 sec.
 - ❖ Delay A+ 2 sec.
 - Build pneumatic circuit by using pneumatic workstation.
 - Checking the circuit against any air leakage.
 - Connecting the circuit power supply.
 - Checking the circuit against any short circuit connection.
 - Checking the circuit against any circuit malfunctions.
 - Operating the circuit achieving the required sequence.
 - Professional Practice.

Day-2-Task 8-Challenge task

(1 hours)

The committee will decide the type of required challenge task (pneumatics/electro-pneumatics/LOGO) where the competitors must do it.



Day-3-Task 9-LOGO module

- Write the suitable program to operate the following electro-pneumatic circuit with the following sequence B- A+ B+ A- B- B+, functionality using PLC (LOGO module) and LOGO soft comfort software.

Under the following condition:

- ❖ **Operate single cycle.**
 - Checking the circuit against any air leakage.
 - Connecting the circuit power supply.
 - Checking the circuit against any short circuit connection.
 - Checking the circuit against any circuit malfunctions.
 - Operating the circuit achieving the required sequence.
 - Professional Practice.

❖ **Continues cycle.**

Day-3-Task 10- Troubleshooting of LOGO module

(3 hours)

The chief expert and experts will create program by using LOGO module to control electro-pneumatic circuit and will create 6 faults on this program and the circuit. Each team has to find these faults and operate the electro-pneumatic circuit correctly according to the given program. For example, sequence A+ B+ A- B-

Note:

- 1- The faults may be on the LOGO software or Electro-pneumatic circuit with LOGO block on the work station.
- 2- If any team operates the correct sequence (for example rebuild the circuit again without finding. The faults and repair them) will take marks for the correct sequence only.

Fault	Done		Where the fault in the circuit?	Comments
	Yes	No		
1				
2				
3				
4				
5				
6				

Correct sequence	Team Sequence	
	Yes	No
A+		
B+		
A-		
B-		

Starting time: _____ Ending time: _____

Time taken: _____



Section 4:

List of the used items/components per station in all tasks:

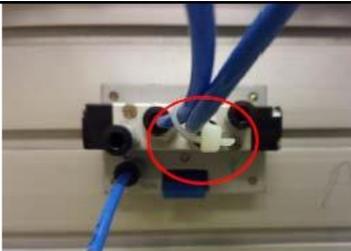
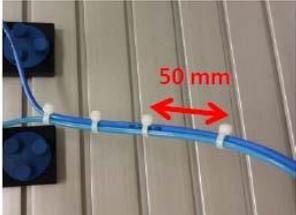
	#	Item Description	QTY/Station
Pneumatic Section	1	Double acting cylinder	2
	2	One way flow control valve	2
	3	5/2 way valve double pilot	3
	4	OR gate -shuttle valve	1
	5	AND gate - Two pressure valve	1
	6	3/2 way, roller lever valve, NC	4
	7	3/2 way valve, selector actuator, NC	1
	8	3/2 way valve, push button actuator, NC	1
	9	Pneumatic time delay valve NC	1
	10	Quick coupling between an air service unit and air source	1
	11	An air service unit	1
	12	Distributor	1
	13	4mm pneumatic tube	30 pieces Long and medium length
	14	T connection	6
	15	Pneumatics work station	1
	16	Drawer set	1

	#	Item Description	QTY/Station
Electro Pneumatic Section	17	5/2 way valve double solenoid	1
	18	5/2 way valve single solenoid	1
	19	Relay block	3
	20	Switch block	1
	21	Buzzer block	1
	22	Limit switch	4
	23	Photo sensor (optical sensor)	1
	24	DC supply 24 volts	1
	25	Electric wires	1 Bundle

	#	Item Description	QTY/Station
LOGO Module	26	PLC-LOGO-Block	1
	27	PLC programming cable (down load cable)	1
	28	Syslink cable.	1
	29	Universal terminal unit.	1



Mechatronics – Professional Practice (PP) 2017:

Sr	PP	OK	NOT OK
1	Cable ties cut too long, danger of injury! $A \leq 1 \text{ mm}$		
2	Distance between cable ties not more than 50 mm.		Distance between cable ties more than 50 mm.
3	Distance From pneumatic Connection to the first cable tie 60mm +/-5		
4	Collision free movements of all actuators and work pieces		



Sr	PP	OK	NOT OK
5	No tools on the system and on the floor		
6	No wiring or tubing material and other material on the system		
7	All elements, modules fixed properly (no screws loose)	 	
8	No parts or modules broken, damaged or lost (also no cables, wires, etc.)		
9	All pneumatic connections leak-proof		
10	All not used parts keep it in the box		
11	It is allowed to use a pencil or tape to make auxiliary lines and marks only during the troubleshooting tasks All lines, marks and tape have to be removed		



12 Pneumatic tubes too long

