

# **Bangladesh University of Engineering and Technology**

## **Department of Electrical and Electronic Engineering**

### **EEE 318 Control System I Laboratory**

#### **Experiment 2**

#### **Control of Conveyor system using Programmable Logic**

#### **Controller- Part 2**

#### **Objectives:**

1. To distinguish tall objects from short objects placed on a running conveyor.
2. To classify the tall objects according to three diameters and then to activate the appropriate cylinder-piston to push those respectively into three compartments of a bin e.g. shortest dia objects in compartment-1 (left most), mid dia in compartment-2 and largest dia in compartment-3 (right-most). Each time a tall object is pushed into the bin, the conveyor should stop and to restart it, the green push button switch is to be pressed.
3. Each time a short object is detected, it must not activate any cylinder rather it should run off the end of the conveyor and then the conveyor should shut down. To restart the conveyor, green push button switch should be pressed.

#### **Procedures:**

1. Set the transmitter of sensor-1 at lower position so that it can detect both short and tall objects.
2. Set the transmitter of sensor-2 at a higher position so that it can detect only tall objects.
3. Ensure that the compressed air pump has attained enough pressure.
4. Program the shown ladder diagram with given PR values of the timers and bring the PLC into RUN mode. Press green push button switch to start the conveyor.
5. Place a tall object at the extreme right of the conveyor belt. Do not place an object exactly in front of the sensor-1 because it may lead to improper diameter determination and push by incorrect cylinder-piston.

6. Press the green push button switch to start the conveyor.
7. If the tall objects are not correctly pushed in, repeat steps 5 and 6 changing the present (PR) values of RTO (Retentive On-Delay) timers 901, 906 (for push of the largest dia tall objects by cylinder-3), 902, 905 (for push of the mid dia tall objects by cylinder-2) and 903, 904 (for push of the smallest dia tall objects by cylinder-1). Record the results of step 7-7 as in Table 1.
8. If the conveyor stops following push-in of a tall object, restart by pressing the green switch.
9. **Note:** Despite an appropriate choice of timings for the width (diameter) detection RTO timers (901, 902, 903) the ambient light bouncing off the objects (which are shiny) may affect the performance of these timers and hence the objects will not be pushed in properly. To avoid this situation, switch off some room lights above the experimental table to reduce the ambient light or shield the sensors from ambient light by some piece of non-transparent paper.
10. Place a short object as in step 5 and observe if it runs till the end of the conveyor and then falls down without being pushed into bin. Also note if the conveyor stops then.
11. Repeat step 9 with various PR value of RTO timer 910 to change the time elapsed between fall down of a short object and shut down of the conveyor. To restart the conveyor, press the green switch. Record results in Table 2.

Table 1: Push-in of tall objects

Tall objects dia (large/mid/small)	Timer settings (sec.)						If pushed, by which cylinder
	901	906	902	905	903	904	

Table 2: Observation on short objects

Short objects dia (Large/mid/small)	Activation of any cylinder (yes/no)?	PR of RTO 910 (sec.)	Actual time between fall of object and stop of conveyor

## Report:

1. Explain the operation of the ladder diagram programmed into the PLC.

[**Partial hints:** To activate a cylinder through latching the corresponding output relay (703/702/701), all the normally open contacts in respective rung (5/6/7) must be closed in addition to interruption of the sensor-2 beam. Now the larger the diameter of the object, the more time the sensor-1 in Rungs 2,3, 4 remain in TRUE states and hence all the timers with higher PR value can time out and close their associated 'normally open' contacts. This is the way the three RTO timers 901, 902 and 903 jointly discriminate large, mid and small dia objects and decides which cylinder is to push the objects.]

2. Show Tables 1 and 2.







