Prelab Section:

Before starting the experiment, preparatory work was conducted in the control laboratory. Initially, the system requirements were analyzed, focusing on the logical operations such as using two photoelectric sensors, triggering the servo motor with a timer, and stopping the conveyor motor with a counter. The ladder diagram created in SoMachine software was tested in a simulation environment, confirming the proper functioning of all components. Subsequently, the program was loaded onto a real PLC, and the sensors, timer, motors, and counters were connected and tested on a physical setup. During this process, potential issues such as sensor alignment, timing delays, or counter errors were identified and resolved. These preparations ensured that the system functioned correctly and was ready for the experiment.

Photo from laboratory

Assignment Procedure Section:

What was implemented ?

A control system was implemented for a conveyor belt that uses two photoelectric sensors (Sensor1 and Sensor2) to detect unwanted objects. The system performs the following tasks:

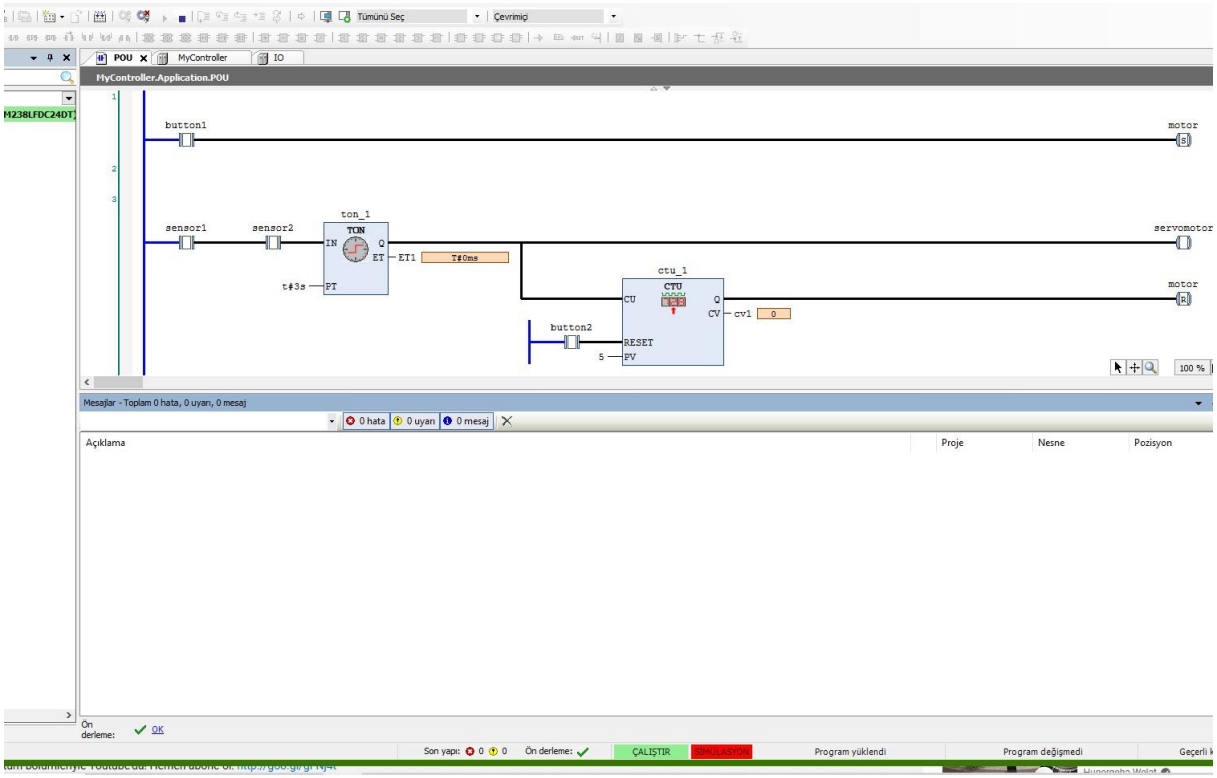
- Sensor1 detects an object passing through the conveyor belt, but if Sensor2 does not detect it simultaneously, the system does nothing.

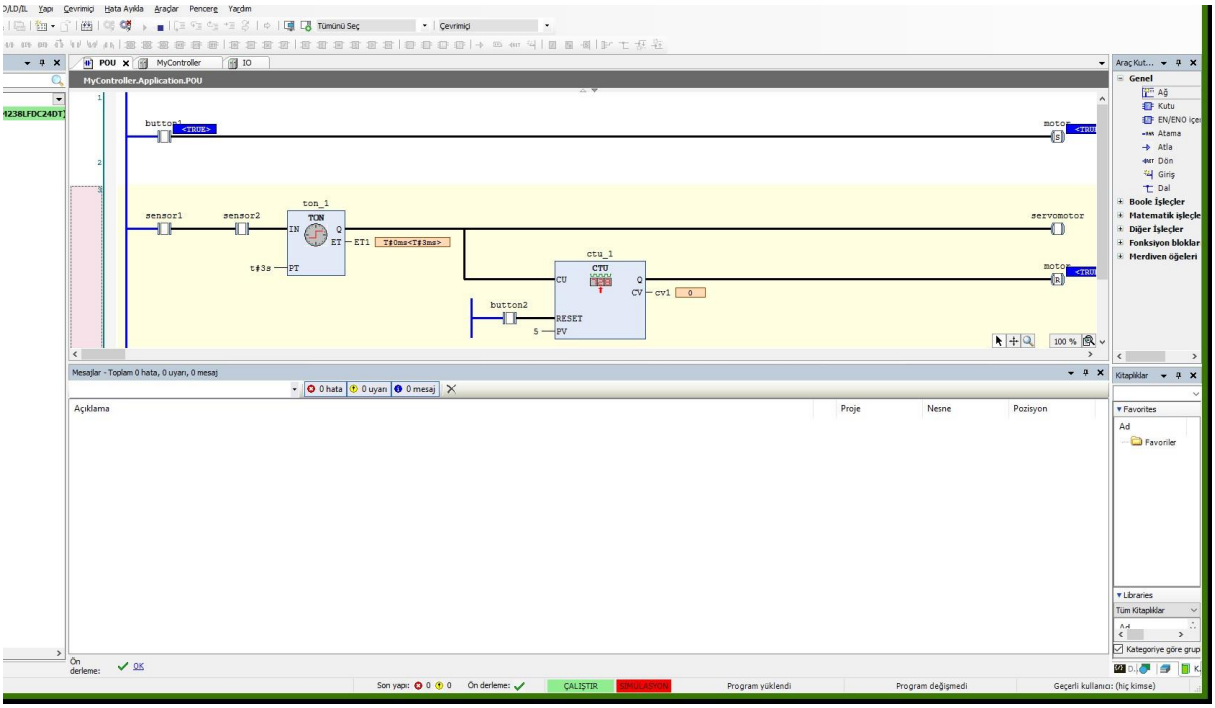
- If both Sensor1 and Sensor2 detect an object at the same time, this indicates that the object is undesirable. In this case, the system triggers a delay of 3 seconds using a timer before activating a servo motor to eject the object from the conveyor.
- The system keeps track of how many undesirable objects have been detected. After 5 undesirable objects are counted, the system stops the conveyor motor to halt further processing. This counting mechanism ensures that the system stops after a predetermined number of unwanted objects are identified and ejected.

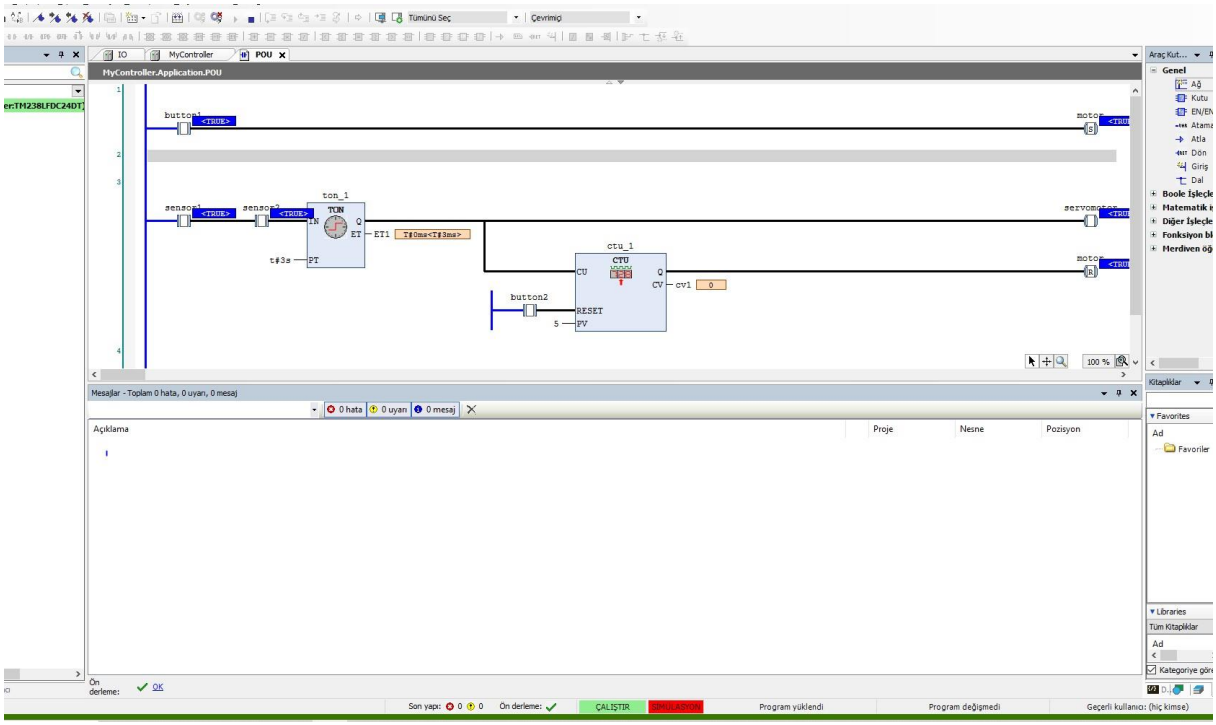
How was it implemented ?

The program was designed in Ladder Diagram format. In the first network, the conveyor motor was started using Button1, and a self-sealing structure ensured the continuous operation of the motor. In the second network, the contacts of Sensor1 and Sensor2 were connected in parallel, triggering a TON (Timer) block when both sensors were active simultaneously. The timer's input signal (IN) was controlled by the states of these two sensors, with a delay time of 3 seconds (PT: T#3s) defined. Once the timer elapsed, the output signal (Q) activated the servo motor. In the third network, every time the servo motor was triggered, a CTU (Counter Up) block was used to count the undesired objects. When the counter reached a total of 5 objects, the output signal (Q) was activated to stop the conveyor motor. Additionally, a "reset" control was added to reset the counter when necessary. All operations were integrated based on inputs from the sensors, using timing and logical control structures, and the system was validated through simulations to ensure proper functionality.

Photos From Simulations:


MyController.Application.POU
button1
motor
sensor1
sensor2
ton_1
TON
IN
Q
ET
ET1
T#0ms
t#3s
PT
servomotor
ctu_1
CTU
CU
CV
cv1
0
button2
RESET
5
PV
100 %
Mesajlar - Toplam 0 hata, 0 uyarı, 0 mesaj
0 hata
0 uyarı
0 mesaj
Açıklama
Proje
Nesne
Pozisyon
Ön derleme:
OK
Son yapı:
Ön derleme:
ÇALIŞTIR
SİMÜLASYON
Program yüklendi
Program değişmedi


Yapı
Çevrimiçi
Hata Ayıkla
Araçlar
Pencere
Yardım
Tümünü Seç
MyController.Application.POU
button1
motor
sensor1
sensor2
ton_1
TON
ET1
T#0ms<T#3ms>
t#3s
servomotor
ctu_1
CTU
button2
RESET
PV
100 %
Mesajlar - Toplam 0 hata, 0 uyarı, 0 mesaj
Açıklama
Proje
Nesne
Pozisyon
Araç Kut...
Genel
Boole İşleçler
Matematik işleçle
Diğer İşleçler
Fonksiyon bloklar
Herdiven öğeleri
Kitaplıklar
Favorites
Favoriler
Libraries
Tüm Kitaplıklar
Kategoriye göre grup
Ön derleme:
OK
Son yapı:
ÇALIŞTIR
SİMÜLASYON
Program yüklendi
Program değişmedi
Geçerli kullanıcı: (hiç kimse)



Result:

In this experiment, Sensor1 and Sensor2 were connected in parallel to detect if both sensors were activated simultaneously. In the first phase, the condition where both sensors detected an object at the same time was observed. In this case, the TON (Timer) block was triggered correctly. The timer started a 3-second delay, and after this period, the output signal (Q) successfully triggered the servo motor.

When the servo motor was activated, the unwanted object was ejected from the conveyor belt. This process occurred when both sensors were active, and the timer had completed its delay. The connection between the timer and the servo motor worked smoothly, ensuring that the object was correctly ejected after the set delay.

In the second phase, the CTU (Counter Up) block was triggered. The counter counted each unwanted object every time the servo motor was activated. A total of 5 unwanted objects were detected during the test. When the counter reached 5, the output signal from the CTU block activated the process to stop the conveyor motor. This confirmed that the conveyor motor stopped as expected, and the counter mechanism worked correctly.

Throughout the experiment, it was observed that every component of the system worked as intended, detecting and processing unwanted objects. The coordination between the motors, sensors, and timers was flawless, and the program operated according to the intended logic. As a result, the experiment successfully demonstrated that all functions of the system, including detection, processing, and halting the conveyor motor, were carried out correctly.