



Benha University

Prof. Mohamed Ahmed Ebrahim

Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Dept.



Industrial Controls (1)

By



Associate Prof. / Mohamed Ahmed Ebrahim Mohamed

E-mail: mohamedahmed_en@yahoo.com

mohamed.mohamed@feng.bu.edu.eg

Web site: <http://bu.edu.eg/staff/mohamedmohamed033>





Lecture (9)
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Advanced PLC
Industrial applications

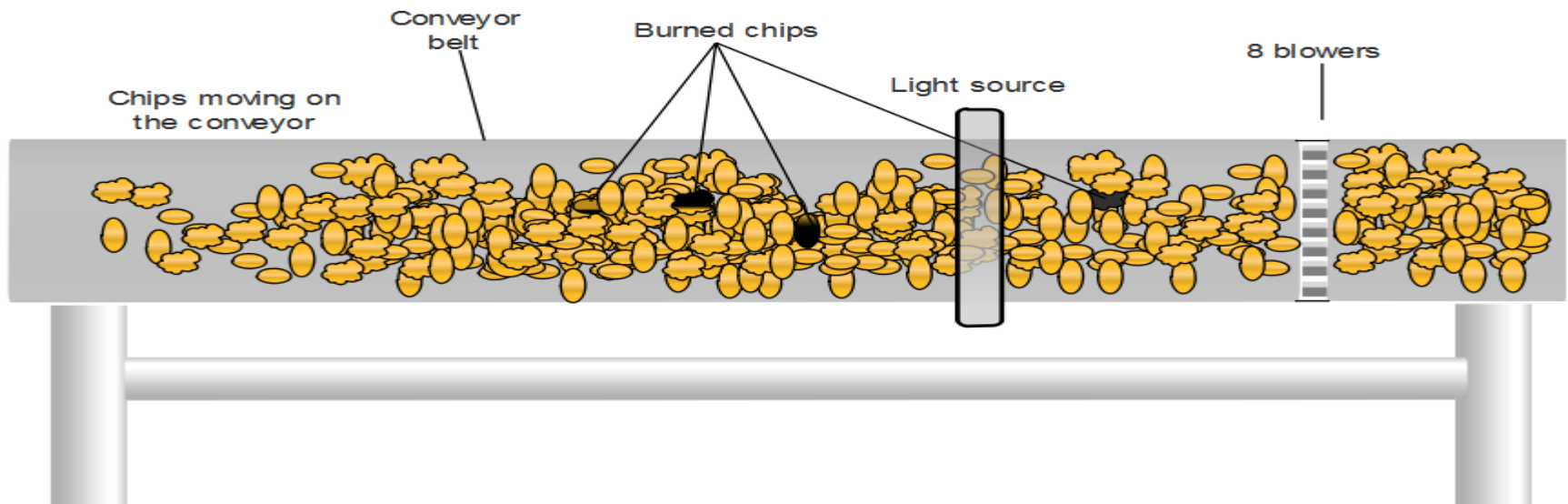
Prof. Mohamed Ahmed Ebrahim

EX:(1):PLC Program to Detect Burned Chips and Remove Them

- **Problem Description**

Potato chips are made and ready to be packed. But before that, it goes through a conveyor in which final quality check is done, burnt chips are detected and removed from the process line.

- **Problem Diagram**

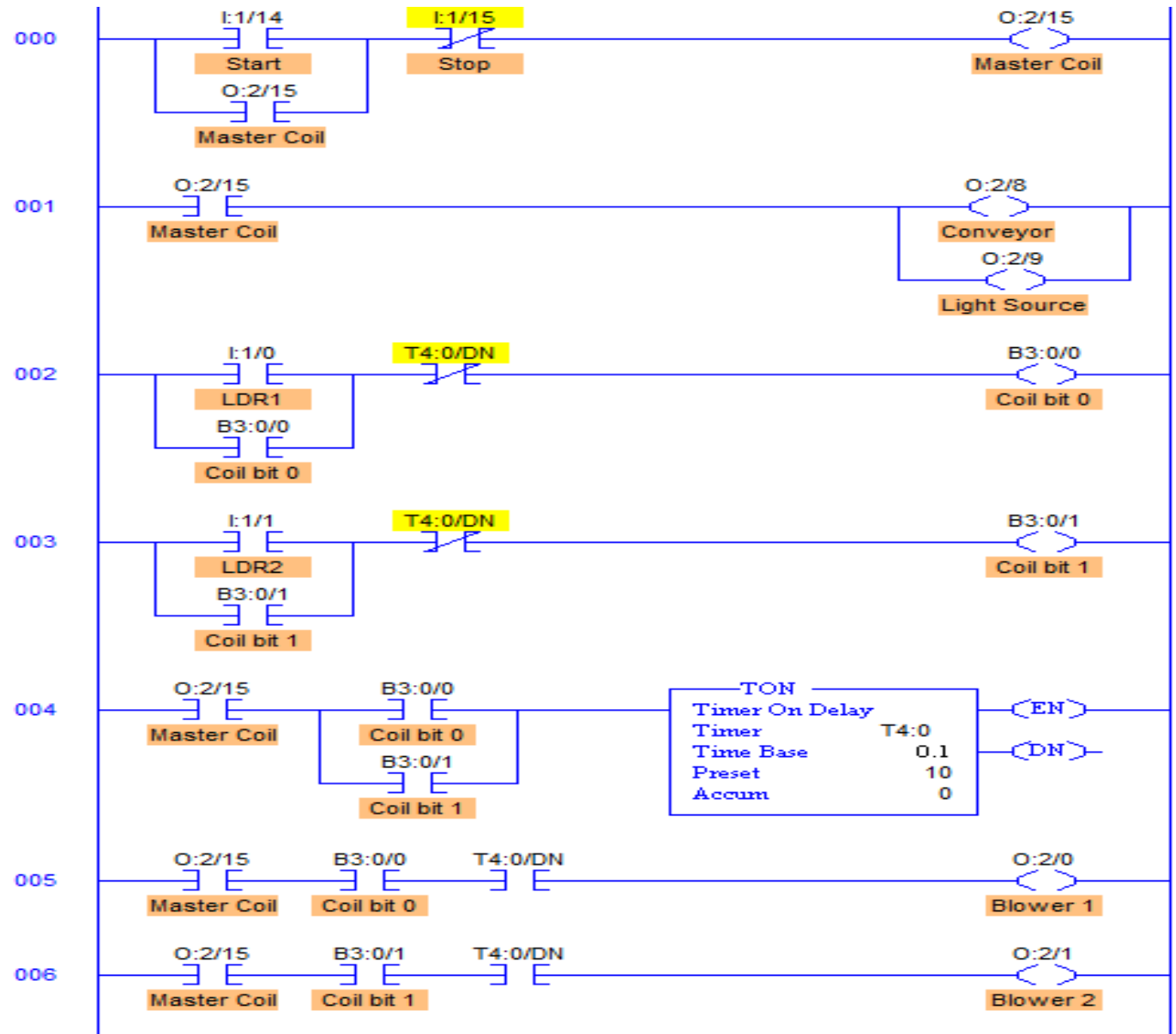


- **PLC Program**

List of Inputs and Outputs

I:1/14	= Start	(Input)
I:1/15	= Stop	(Input)
O:2/15	= Master Coil	(Input)
O:2/8	= Conveyor	(Output)
O:2/9	= Light Source	(Output)
I:1/0 to I:1/7	= Light Dependent Resistors	(Input)
B3:0/0 to B3:0/7	= Bit latching	(Bits)
O:2/0 to O:2/7	= Blowers	(Output)
T4:0	= Timer to activate blower after 1sec	(Timer)

- Ladder diagram to accomplish quality control by removing defected chips



EX:(2):PLC Program to do mathematical functions

- **Problem Solutions**

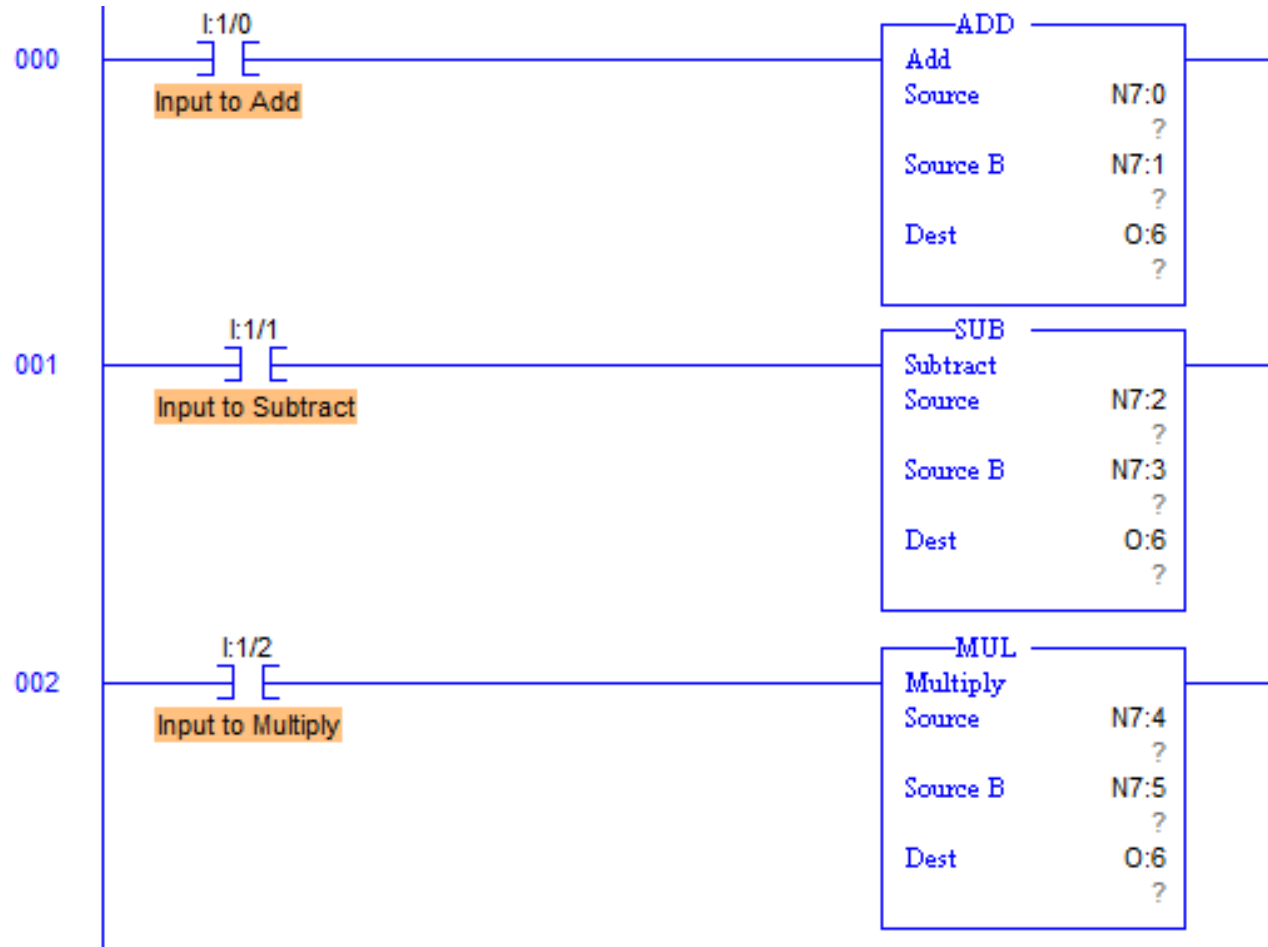
- I. Use all the Math Instructions to implement various Mathematical Arithmetic Functions.
- II. Use **ADD** to add one piece of data to another.
- III. Use **SUB** to subtract one piece of data from another.
- IV. Use **MUL** to multiply one piece of data by another.
- V. Use **DIV** to divide one piece of data by another.
- VI. Use **SQR** to find the square root of a piece of data.
- VII. Use **NEG** to change the sign of a piece of data.

- **PLC program**

List of Inputs and Outputs

I:1/0	= Input to Add	(Input)
I:1/1	= Input to Subtract	(Input)
I:1/2	= Input to Multiply	(Input)
I:1/3	= Input to Divide	(Input)
I:1/4	= Input to find Square Root	(Input)
I:1/5	= Input to change the sign of a Number	(Input)
N:7/0 to N:7/9	= Integer Number Location	(Input)
O:6	= Display	(Output)

- Ladder Diagram to implement mathematical arithmetic functions



PLC Testing Methods

PLC Testing Methods

1. Hardware test stand

Hardware test stand used to simulate the I/Os of hardware devices in the field.



Typical hardware Test Stand.

The Test Stand is made by many LED indicators, toggle switches, analog signal generators, and meters that are wired to the PLC's input and output modules. The toggle switches and the analog signal generators are used to simulate the sensor inputs and the LED indicators and the meters are used to indicate the PLC outputs.

2. Human Machine Interface (HMI) Based Simulator

- Another approach that is often used for simulating the PLC I/Os is a HMI based software simulation.
- In this approach, a HMI control screen is developed and used for the PLC I/O simulation. The HMI control screen can be made as a SCADA system screen or a standalone Operator Terminal screen.
- it is still a manual simulation and it's time-consuming to make the I/O simulation screens themselves.
- A HMI based simulator can be used to test all functions of a PLC program. But the timing between a command and the response for the command is not automated.

3. New approach “virtual” simulator

This research proposes an automated testing tool that can simulate the PLC I/O signals via “virtual” wires and automate the test execution. There are no physical hard wires connected between LogixPlcTester and the PLC being tested. This tool helps PLC software developers and testers test PLC programs during the entire software development stage and the testing stage. It can be used for both unit testing and system testing. The goal of this tool is to assure quality of PLC programs and to deliver reliable PLC programs for industrial control systems.

Thank You
For Your Attention



*Mohamed Ahmed
Ebrahim*