

Lab4Schools
Lab Activity “Bottle Sorting Line”





IPSIA - Istituto Professionale Statale dell'Industria e l'Artigianato
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Our school was born in 1882, with the aim to provide a good training course to the workers.

In the last few years there are three courses: mechatronics, optics and optometry and health and social care.

In our school, the different laboratories play a key role because nowadays there is an increasing digitalization of manufacturing processes so the courses are tailored to industry needs, when our students leave finish the school they are ready to launch their career in whatever industry they train in.

Here in after there are some lab activities that our students showed to their foreign colleagues:

1) Bottle sorting line

The aim is to let students able to write a program to manage a bottle sorting line.

To be able to write the program the students had to study the following topics:

- **Conveyor belt:** It is made of a band, which is held by a number of wheels. It is a mechanism which is designed to transport or move physical items like materials,

goods, even people over a distance, from one point to another throughout the production process. Unlike other conveying means that employ chains, spirals, hydraulics, etc., it will move the items using a belt. In particular it is a looped belt that is driven by and wrapped around one or more pulleys. All conveyor systems have three main components: the driving unit, the extremity unit and the aluminum profile.

They are powered by an electric motor and supported by a metal plate bed or rollers upon which the conveyor belt rests.

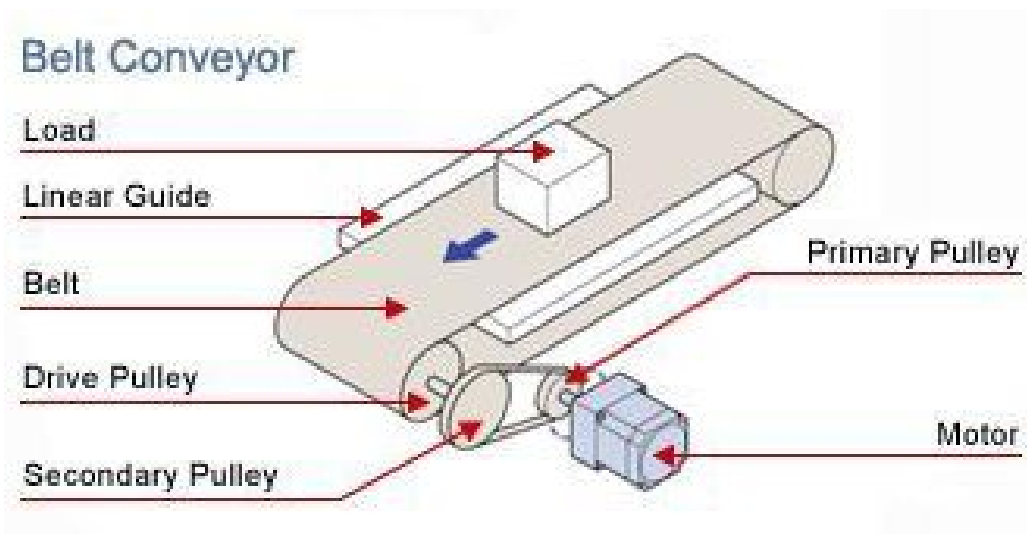
The conveyor belt uses two motorized pulleys that loop over a long stretch of durable, thick material. When motors in the pulleys operate at the same speed and spin in the same direction, the belt moves between the two.

It can transport large volumes of goods in a short amount of time, reducing the time and effort needed to move them manually. Subsequently this increases the overall efficiency of the manufacturing process, allowing companies to produce more goods in a shorter amount of time.

Moreover it improves safety in the manufacturing industry. It eliminates the need for workers to manually move heavy materials, reducing the risk of injury or accidents.

It also has safety features built-in, such as emergency stops and automatic shut-off.

It is widely used in the manufacturing industry, a lot of companies invest in it so they request a specialized worker.



- **Electric motors:** use the force of magnetism to transform electrical energy into mechanical energy. A motor has two parts: the rotor which moves and the stator which is stationary. Usually the rotor revolves inside the stator and turns an axle which carries the mechanical energy to do the work of the motor (called the “load”). Normally the stator is a permanent magnet and the metal rotor has coils of wire

wound around it. When an electric current passes through the wire, the rotor becomes an electromagnet. Its poles are attracted by the opposite poles of the stator and it begins to turn. To keep it turning it is necessary to continually change the poles of the electromagnet by constantly reversing the current flowing through the wire. If alternating current from the mains is used, this reversal in direction happens automatically. The turning power of the motor is called the “torque”. The power is measured in watts and the speed in rpm (revolutions per minute). Speed and torque depend on the amount of electric current and voltage. Electric motors may run on direct current or on alternating current from the mains.



Once the students have mastered these notions they will be able to learn how a bottle sorting line works and how to write a program to manage it.

Nastro bottiglie / PLC_1 [CPU 1214C AC/DC/Rly] / Program blocks

Main [OB1]

Main Properties

General

Name	Main	Number	1	Type	OB
Language	LAD	Numbering	Automatic		

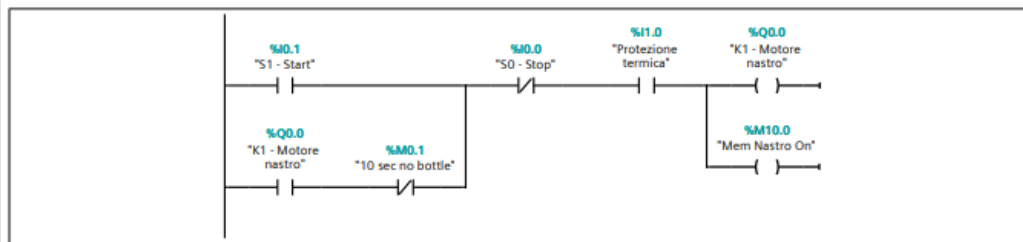
Information

Title	"Main Program Sweep (Cycle)"	Author		Comment	
Family		Version	0.1	User-defined ID	

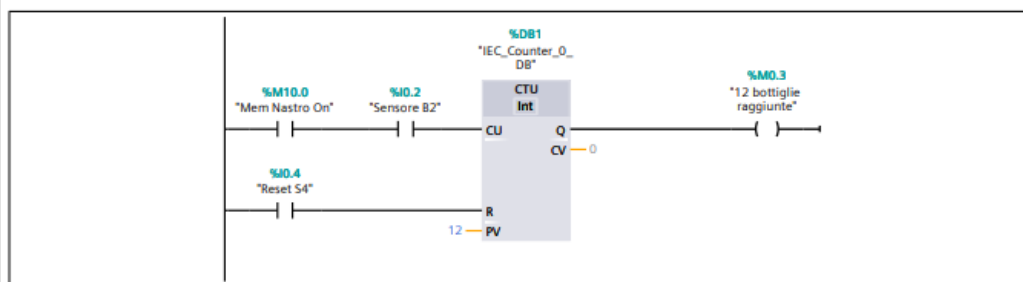
Main

Name	Data type	Default value	Comment
▼ Input			
Initial_Call	Bool		Initial call of this OB
Remanence	Bool		=True, if remanent data are available
Temp			
Constant			

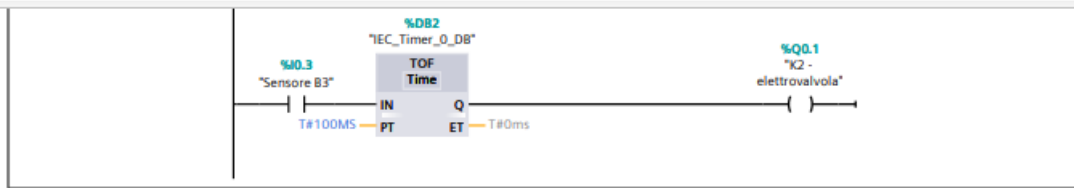
Network 1: Marcia impianto



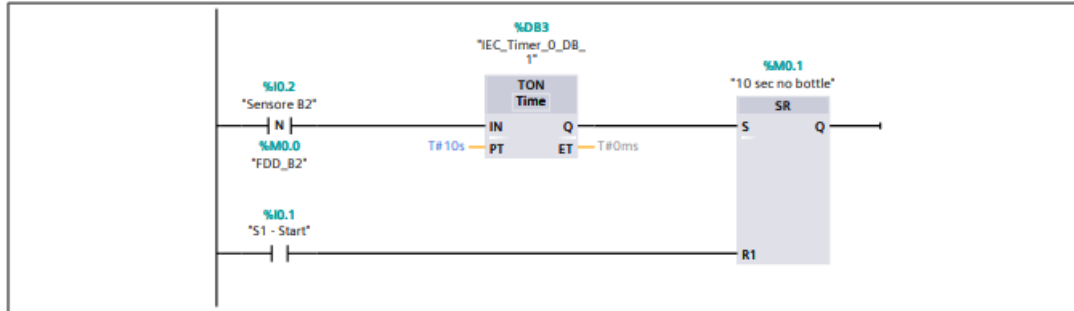
Network 2: Contatore per 12 bottiglie



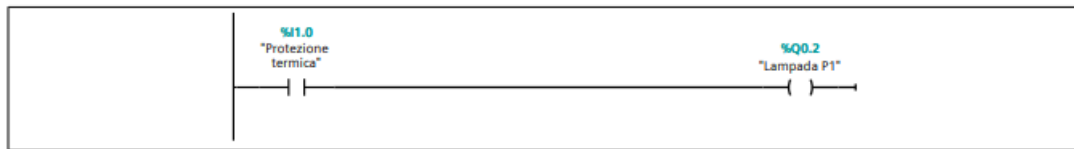
Network 3: Espulsore elettropneumatico



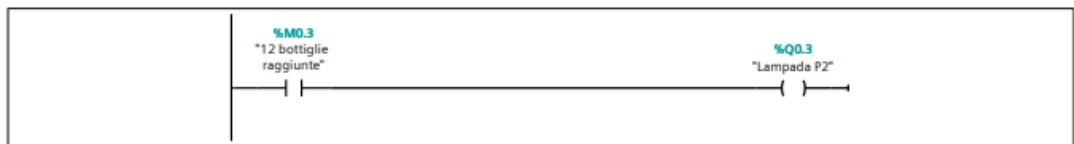
Network 4: Tempo assenza passaggio bottiglie



Network 5: Segnalazione protezione termica intervenuta



Network 6: Segnalazione conteggio 12 bottiglie



Network 7: Segnalazione impianto in marcia

