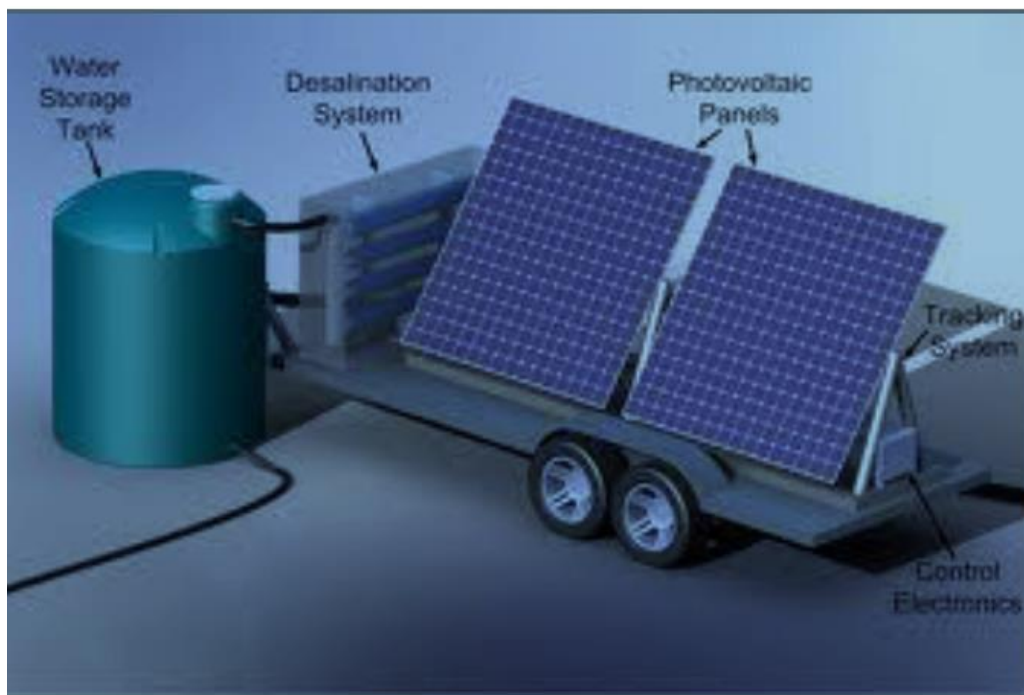


Project name: RO plant by using solar energy.

Problem: In border areas and out of cities a lot of people suffered from less in potable water quantities and quality in addition to the rare of the fossil energy in some of these places.



OBJECTIVE:

Use the solar energy technologies to find a way to produce portable water from the sea water by using Ro (reverse osmosis) filtration methods.

Solar energy:

Solar energy is the conversion of sunlight into electricity, either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic convert light into electric current using the photoelectric effect.

Reverse osmosis:

Reverse osmosis (RO) is a membrane technical filtration method that removes many types of large molecules and ions from solutions by applying pressure to the solution when it is on one side of a selective membrane. The result is that the solute is retained on the pressurized side of the membrane and the pure solvent is allowed to pass to the other side. To be "selective", this membrane should not allow large molecules or ions through the pores (holes), but should allow smaller components of the solution (such as the solvent) to pass freely.

In the normal osmosis process the solvent naturally moves from an area of low solute concentration, through a membrane, to an area of high solute concentration. The movement of a pure solvent to equalize solute concentrations on each side of a membrane generates osmotic pressure. Applying an external pressure to reverse the natural flow of pure solvent, thus, is reverse osmosis. The process is similar to other membrane technology applications. However, there are key differences between reverse osmosis and filtration. The predominant removal mechanism in membrane filtration is straining, or size exclusion, so the process can theoretically achieve perfect exclusion of particles regardless of operational parameters such as influent pressure and concentration. Reverse osmosis, however, involves a diffusive mechanism so that separation efficiency is dependent on solute concentration, pressure, and water flux rate.

Reverse osmosis is most commonly known for its use in drinking water purification from seawater, removing the salt and other substances from the water molecules.

Get the way to provide a green solution to the people who suffer from rare of water by using the solar energy and the reverse osmosis phenomena and identify the amount of fresh water which can produce from your plant.

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

١- Project Name: Automated battery filling station.

Problem: Filling hazardous liquids (H_2SO_4) in battery factories have the negative effect on the labor health in these factories

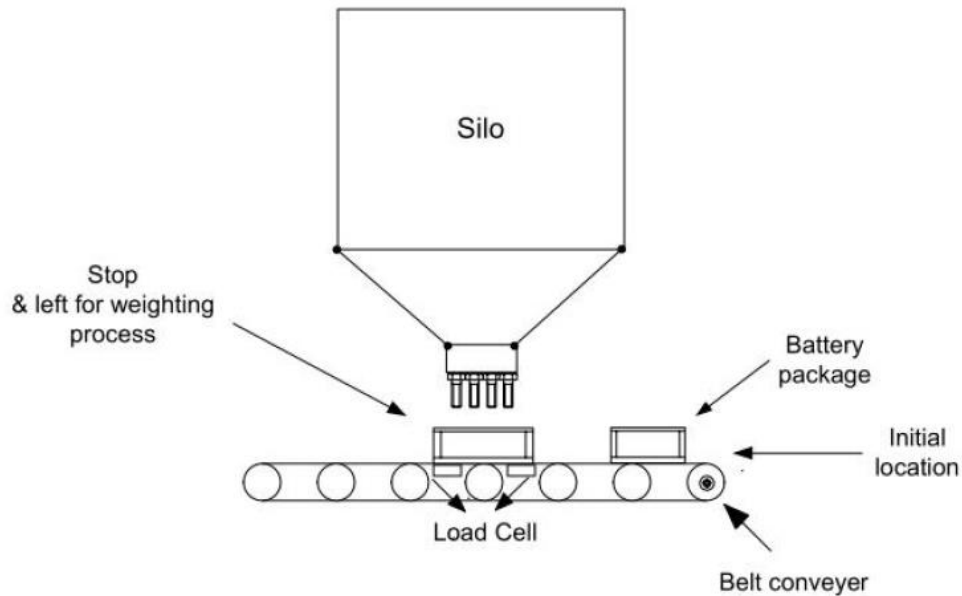


Figure ١-١): Liquid filling station.

Objective:

Reliability, precision and high throughput of liquids are the basic requirements of liquid filling station and checking the weight with ٢% accuracy.

Sensor requirements:

The integration of the SIWAREX MS module (weighing system) with the controller and ensure that the technological functions of the weighing module are combined with all advantages of the PLC (expansion capability, flexibility, software, HMI, drives, communication interfaces, proximity sensor and conveyer.)

Controller requirements:

The automation solution uses controller and the SIWAREX MS weighing module with load cells. The weight value of the packaged item is captured and compared to a reference value. This enables to check whether filling process is complete or not.

The controller manipulates all the process sequence according to the sensor signals and giving the proper action as following:

- ١- The machine operator has to give the start command to start in filling process
- ٢- The controller has to keep the container directly under the filling hose.
- ٣- Stop the conveyer and left up the container to proceed in weighing step.
- ٤- Start the filling process and continuously comparing with the desired set point.
- ٥- IF the final weight in not correct, you have to adjust it by fine tune.
- ٦- Move the container and wait for new command.

HMI requirements

- The HMI is to be realized by a touch panel.
- The following information is to be displayed:
 - Set point and filling weight.
 - The status of conveyer.
 - Number of filled items.

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

٢- Project Name: Colors detection and making for painting industry

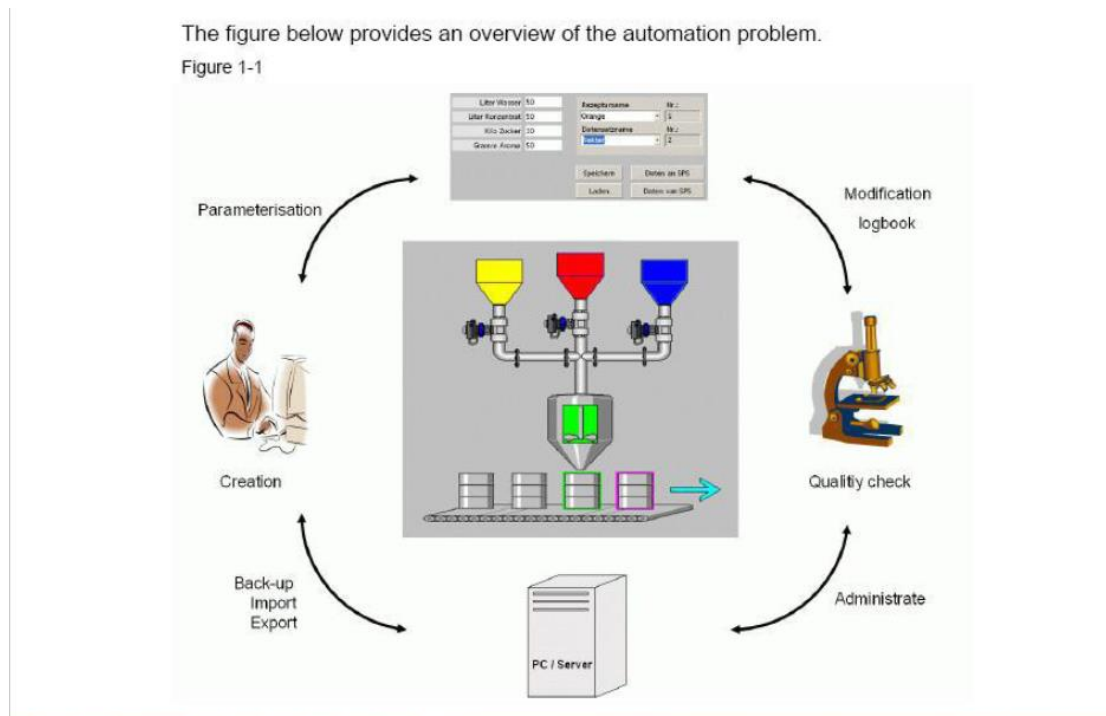
Problem:

In a sub process in the painting industry colors are mixed from different primary colors.

These individual colors are transported to a collecting mixing tank after an individual preprocessing. From there the color is barreled.

Color inspection for a new order which the client give to the factory as a part of component have that color and the client want the same color with the same degree.

That is a big problem to the factory according to many times of try and error to make the color like it and with the same degree. And because of the absence of color analyzers and for recording the recording the results exactly and in automatic way not manual.



Objective:

Design an automation system which can analyze any given color and make it from the basic colors.

The individual color compositions are selected via a recipe display which includes all parameters.

If a recipe or parameter is changed, this change will be documented in a modification logbook (audit trail file). This enables to subsequently determine which person processing made this change and possible “wrong fillings” can be verified. This ensures that a quality inspection of the generated products is achieved which is as integrated as possible.

Different production requirements make it necessary that all recipes (color compositions) are centrally stored on a separate storage medium or PC / server and that they can be called individually.

New color compositions are mixed in the production development and integrated into the running process as and when required.

Controller requirements

According to the parameter sets, which are transferred to the controller via the HMI operator panel, the controller processes the values and transfers them to the corresponding valves, drives, Level, etc.

HMI requirements

- The HMI is to be realized by a Touch screen.
- Color inspection and analysis and converted to recipe done automatic by the machine.
- Manual mode with recording for the mixing process.
- The following operating options are to be available:
 - Option to change all recipe parameters
 - Writing the data records into the controller
 - Reading the data records from the controller
 - Exporting data records
 - Importing data records
 - Adding new data records
 - Deleting existing data records
 - Daily backup of the recipes

- Display of the current process progress (displaying the representation of the filling process).

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

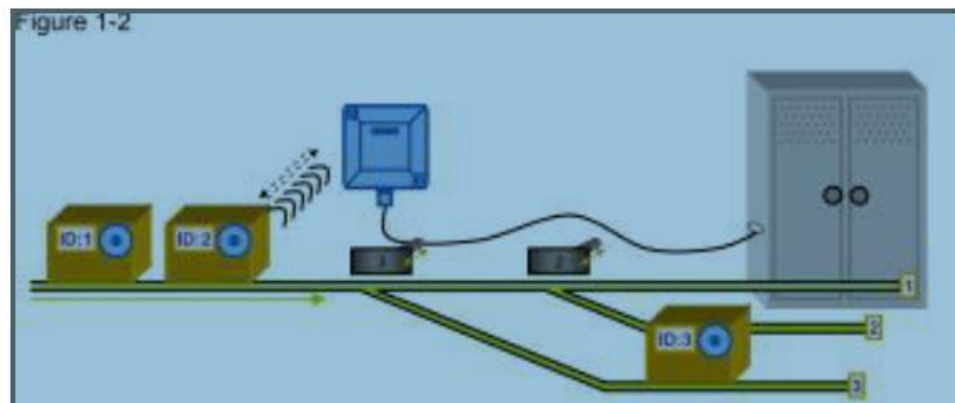
٣- Project Name: Error inspection and quality assurance using RFID.

Problem:

In a packaging system, a check for completeness of the packaged goods is required before delivery. In the course of this quality assurance measure the goods are to be uniquely identified and all relevant data including timestamp are to be logged.

In many cases the number of packaged goods are not filled as supposed for the suitable packaging container and when system have many packaging container with different sizes and they weight difference are nearby.

So the system can't take the action if this packaging container,,s goods are increased or decreased so the system can refill the packaging container with goods or empty it from some goods.



Example:

The packaging container can consist of $1 \cdot$ numbers of goods and some other packaging container can consist of $1 \circ$ number of the same goods In case of the big packaging container (which have to be filled with $1 \circ$ goods) only filled with $1 \cdot$ goods the system give that the weight is ok but in reality that is an error and if the big packaging container have $1 \backslash$ goods so the system can't detect the error for big packaging container or for small packaging container.

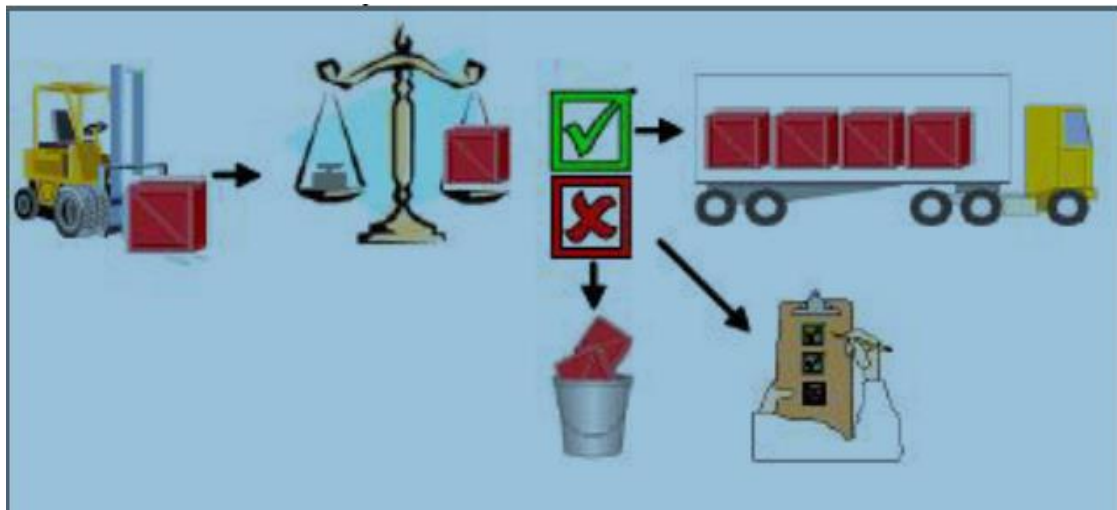
Objective:

Design a system that solve the above problem using RFID technology for identifying the packaging container and choose a suitable tag for that.

Use RFID to identify the volume, expected weight of the packaging container and number of the products in the packaging container.

Use weighing system to check for the completeness of the packaging goods and give the proper action.

The weight value of the packaged goods is captured and compared to a tag's reference value (expected weight and number of products). This enables to check whether all components are complete.



It is to be possible to import the log data to Office Excel. The automation of the logging process and the integration of the required components into the existing infrastructure of the packaging system are to be possible.

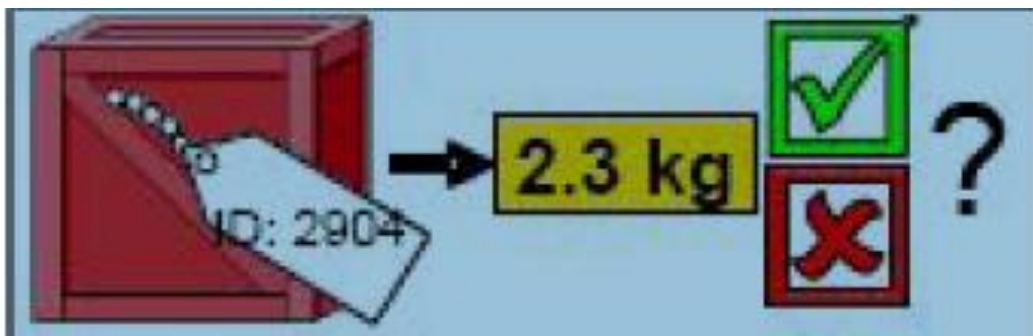
It must be possible to apply the check for completeness of the packaged goods also to other products with different content without extra work. The packaging system is to be operated and maintained exclusively via an HMI device.

For each product a unique identification number is read in by a RFID reader. This product ID will later be used for tracking in the log data. After the product identification a subprogram for the quality assessment is started.

The subprogram checks the weight value by comparison with two reference values:

Weight reference value (optimum product weight)

Tolerance reference value (maximum permissible deviation from the weight reference value expressed as a percentage and number of products) If the real weight value of the product is in the tolerance range of the requirements, the quality of the current product is assessed as good.



After completing the quality inspection the result of the quality inspection is assigned to the product ID.

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

٤- Project Name: Humidity Control System.

Problem: The negative effect of humidity in the food industries and warehouses.

Objective:

Humidity Control System is a system that absorbs excess humidity from the air and also releases moisture back in the air, always you have to maintaining the optimal food storage conditions and it is necessary in many working environment and industry sector as in food and beverage. It's important to keep the temperature and the humidity in the desired level as in figure ١-١).

Sensor requirements:

- Humidity sensor.
- Temperature sensor.

Problem: The negative effect of humidity in the food industries and warehouses.

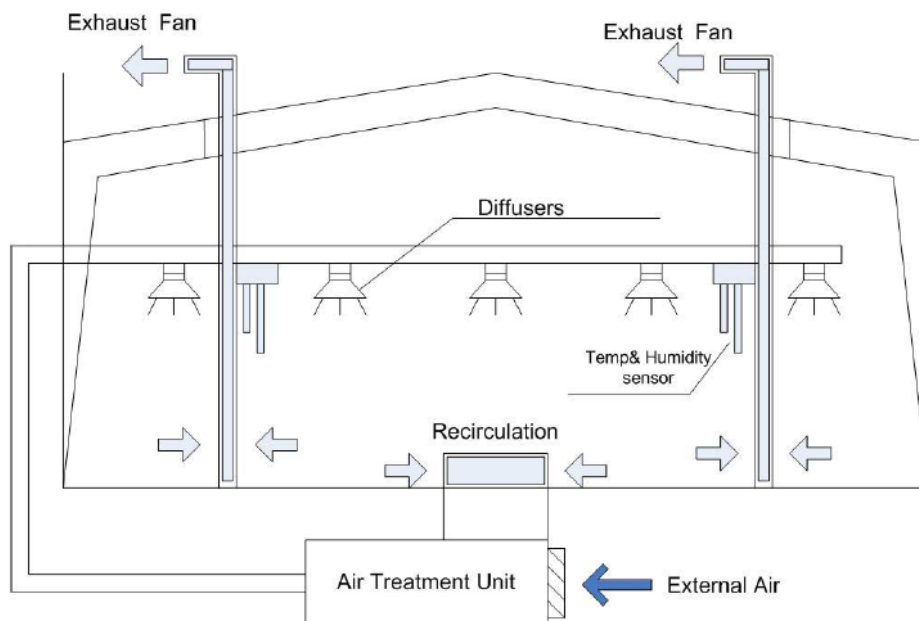


Figure 1-1: Humidity control system.

Controller requirements:

- The controller will calculate the relative humidity and temperature indoor according to the sensor signal.
- The controller will manipulate the exhaust fan speed and operation of the air treatment unit to keep the humidity and temperature in the desired limit.

HMI requirements:

- The HMI has to be realized by a touch panel.
- The following information is to be displayed:
 ١. Current humidity and temperature.
 ٢. Desired set point.
 ٣. The status of the air treatment unit.

Note:

For all groups, the budget and total cost of the project has to be considered as a solution and able to use it industry sector.

•- Project Name: Immersing machine unit

Problem:

In metal production factories the labor manually used to immerse some metal object inside big tanks which consist of hazardous and volatile chemical substances as a part of the process.



Objective

Provide automatic machine to carry out all the required function for the metal coating and galvanizing process that will protect the labors from toxic and volatile chemicals according to the international safety instruction and regulations

Controller requirements:

Preconditions (initial status):

The process can only be started if the crane is in its initial position:

- The gripper is empty
- The gripper is located above the starting position

Operational sequence:

The controller has to achieve the following sequence of operation:

1. The conveyor transports a new metal object to the starting position.

٢. The gripper picks up the new metal object.
٣. The crane follows the calculated travel path until it reaches the target position. The target position is above a tank which consists of chemical substance.
٤. After the gripper has reached the target position, the controller has to give the command to the crane to immerse down the metal object inside the tank for ٣٠ seconds
٥. Following the calculated travel path, the crane returns to the other end of the conveyer
٦. The process will be repeated with the next metal objects.

Note:

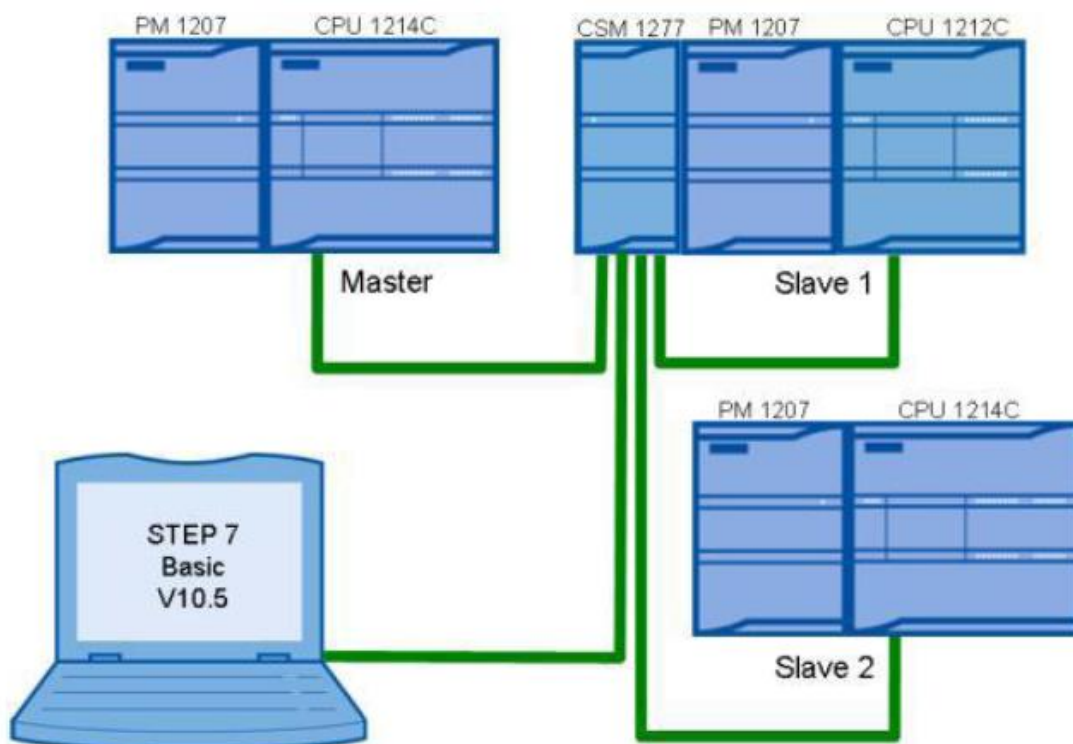
For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

٦- Project Name: Integrate different existing sections in a Factory.

Problem:

Integration of inbound, Internal processing, outbound is a challenge in industry to enhance productivity and improve efficiency.

Factories are seeking integration of preparation unit, machinery section, and outlet to automatically identify production requirement and planning.



Objective:

- Integrate three main sections of a blending plant:
 ١. blending section
 ٢. Filling lines
 ٣. Warehouse
- The system must gather the data from different section, analyzers, and take necessary actions to plant to plan blending batches based on outlet consumption



- Design a system using the above concept to make a process in production line that needs the cooperation efforts for the all controller under the master control lead
- Data exchange (e.g. for time synchronization) shall be enabled between a master controller and several controllers.

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector.

V- Project Name: Quality inspection

Problem:

Quality inspection for bolts and recognizing good parts according to the size and shape.

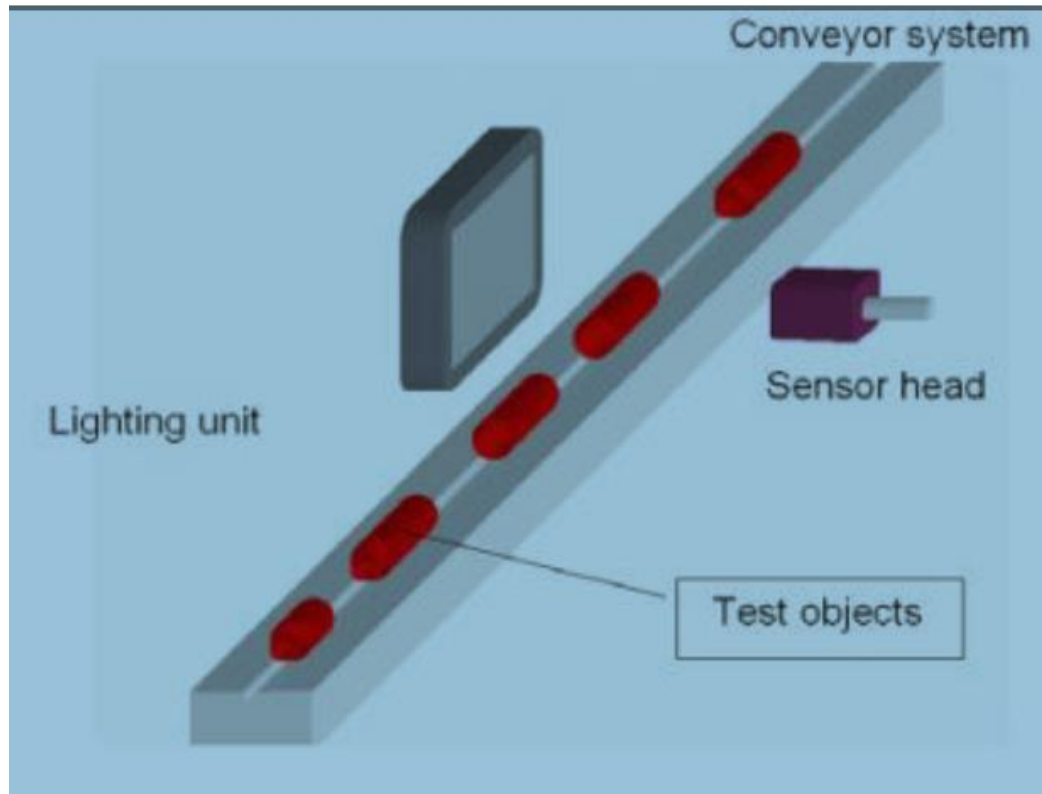


Figure ١-١): Quality inspection

Objective:

Providing fast and accurate machine to monitoring production lines and easy identify for the faulty bolts according to the shape and size and rejected from the line as a proper way for quality inspection

Sensor requirements

Vision Sensor and image processing system consists of lighting unit, sensor head camera) and processing unit. These three components and all cables are necessary for the operation. Two different versions of the set are available: One for small test objects and one for large test objects. The sensor head and the lighting unit are mounted in such a way that the objects

to be detected move between lighting unit and sensor head (see figure ١-١).

Controller requirements

The SIMATIC Vision Sensor is used for the optical detection and testing of objects with lighting unit.

The SIMATIC Vision Sensor checks the size and shape of the object then decide the correct or damaged items.

The SIMATIC Vision Sensor returns the following recognition values during object recognition:

- X coordinate
- Y coordinate
- Angle
- Quality rating of the specimen, number of detected parts

This object recognition data is transferred to processing units in automation systems. The data is processed in the processing units of the automation systems.

Functionality, the controller should enable the following action:

١. Running table conveyor belt in two different directions.
٢. Hold the object for ٥ second in front of the sensor.
٣. Determining the faulty parts.

HMI requirements

The HMI is to be realized by a touch panel.

The following information is to be displayed:

١. Number of the faulty items
٢. Number of test objects considered to be good
٣. Terminating the runtime

Note:

For all groups, the budget and total cost of the project has to be considered as a solution and able to use it industry sector.

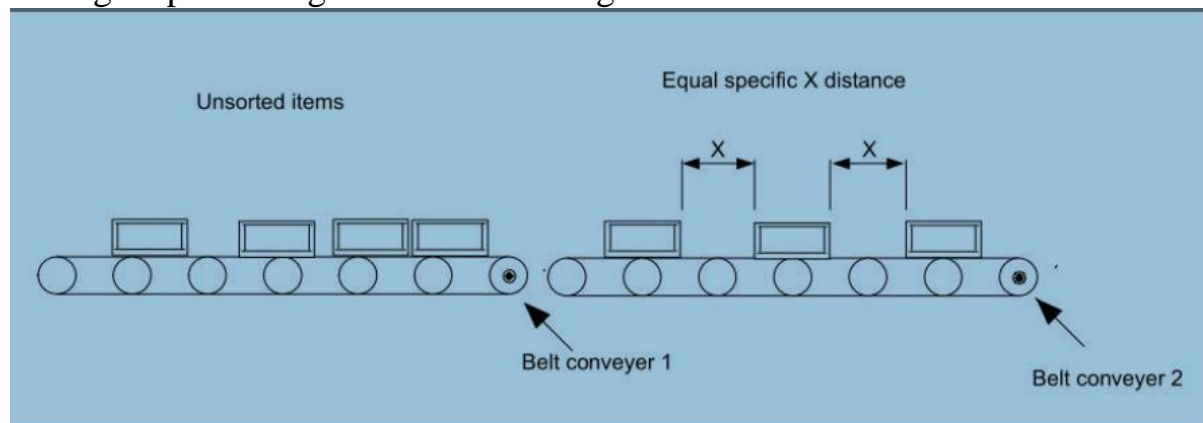
^- Project Name: Sorting and arranging materials in belt conveyer using PC based automation system.

Problem:

PC based automation solution can run on standard Pc systems-either as a pure software PLC or as a slot PLC in the form of a plug-in card. This allows any PC applications, operator control and monitoring tasks as well as technological Functions to be easily combined into an automation solution.

Sorting and arranging materials is an important problem in industry which waste time and efforts for the workers for the production line.

The feedback of executed motions of objects (direction and speed) is used for the sequential control of technical systems and also for controlling and securing the process. It requires reliable sensors and a controller for the intelligent processing of the recorded signals.



Objective:

This application is realized in a PC based Automation project. It is to meet the requirements listed below:

Sensor requirements

- Metallic objects (material to be conveyed) which are to be conveyed past the sensors are to be detected by them. If an object comes into the detection range of a sensor, this causes a signal change from 1 to 0 at the switching output of the sensor.

Controller requirements

- Using the sensor signals, direction and speed of the material to be conveyed are to be determined if the conveyor section is switched on.
- Synchronize the working of the two conveyers to make the sorting and arranging with a specific distance between materials entered by user (can change at any time).
- Synchronize the speed of the two conveyers to do the task.
- Each object detection is to be provided with a time stamp.

HMI requirements

The HMI is to be realized by a touch panel.

The following information is to be displayed:

- The direction of the material to be conveyed (forward/reverse)
- The distance between materials
- The number of the materials
- The speed of the material to be conveyed (in m/s)
- The time stamp of the last object detection
- Mode of the conveyor section (ON/OFF)
- Status of the direction detection (enabled/disabled)
- Status of the speed detection (enabled/disabled)

The following operations are to be possible:

- Enabling/disabling the direction detection
- Enabling/disabling the speed detection
- Terminating the runtime
- Entering the sensor distance
- Entering the display duration

Note:

For all groups, the budget and total cost of the project has to be considered as a solution which will be able to use it industry sector