Selmo

Analysis process conveyor belt

This document describes the implementation of a demo plant using the Selmo method and is divided into five main areas:

1. Structuring the system:
   The plant is called **a "plant"** and is divided into one or more hardware zones **according to its safety requirements.** The control sequences are mapped in separate sequences to ensure clear and structured process modeling.

2. Activity analysis:
   The basic position of the machine defines the initial situation for the automatic sequence, which is activated by a defined start signal. Moving components, such as cylinders or motors, are monitored by sensors in order to precisely control the process steps.

3. Technology analysis:
   The essential technical components are explained, including **actuators, sensors, drives and operating elements** that are necessary for controlling the plant.

4. Functional analysis:
   The control of the movement sequences is described in detail. The interactions between the individual components and their monitoring by sensors and control logic are considered.

5. Process modeling in Selmo Studio:
   For implementation in Selmo Studio, it is recommended to use the preparatory tutorials in the **Selmo Knowledge Base.** In addition, tips are given on the structured modeling of the demo system in the Selmo Studio as well as on the optimal use of the Selmo functionalities.

For more information on the Selmo analysis process, visit our Knowledge Base.

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1. Structuring the system

The **structuring of the plant** is carried out according to Selmo's principles, whereby the stations and processes are divided into logical units (hardware zones and sequences).

The structure of the system is divided as follows:

Plant: The entire conveyor belt is called a "plant", which includes the complete plant.

Hardware zone: The conveyor belt is modeled as only one hardware zone, as the entire system only includes one protected area. Therefore, there is no need to implement multiple independent automatic flows.

Sequence: The sequence of the conveyor belt is modeled in an independent sequence.

2.Activity analysis

An essential part of the process analysis is the definition of the **home position**, which ensures that all modules are correctly positioned and ready for operation. The basic position of the plant is defined as follows:

Light barriers B1, B2 and B3 indicate that the conveyor belt is empty.

The clear definition of the basic position is essential, as it forms the basis for the safe start of the system. Only when the basic position has been clearly defined can the actual **automatic process** be described and implemented.

The automatic sequence of the system can be started by pressing the S1 button. After starting the process, a package is placed on the conveyor belt via the load package. As soon as the package is detected by the B1 (I_Sensor_1), the conveyor belt starts the entrance with the exit (O_Conveyor_1_ON), which transports the package to the B2 (I_Sensor_2) light barrier. After reaching the end position at B2, the conveyor belt exit is activated via the exit (O_Conveyor_2_ON) to transport the package further to the B3 light barrier (I_Sensor_3). The conveyor belt entrance stops as soon as the light barrier B2 has been released, and the conveyor belt exit stops as soon as B3 is free again. The package is then on the ramp and the system shuts down. The package can be removed, and the process can be started again.

3.Technology analysis

Engine:

The components are each driven by electric motors, which are optimally adapted to their speed and power via gearboxes. Drum drives are often used in which the motor is integrated directly into the drive drum to save space. These are switched on and off via the individual outputs Mxx. The motors have no speed control or operating status monitoring.

Start-Button:

The start button is used to start the process. It is configured as a normally open contact, i.e. in idle mode, the voltage to the controller is interrupted and logic "0" is generated at the corresponding input. When the button is pressed, logic "1" is generated by passing on the voltage.

Light barrier:

The photoelectric sensor is an optoelectronic sensor that detects objects by monitoring a beam of light that travels from a transmitter to a receiver. If the light beam is interrupted or reflected by a part, the sensor registers the presence of the object.

4.Functional analysis

This is followed by the functional analysis, in which the operation of the individual components and stations as well as their control requirements are examined in detail. The aim is to define the necessary functions in order to implement the previously developed process efficiently and precisely.

A box is to be transported via a conveyor belt. The crate is to be transported from A to B via two conveyor belts. After pressing the start button, the crate should be placed on the conveyor belt. By occupying the sensor (B1), conveyor belt 1 is started and the crate is transported to the next sensor (B2). After the sensor (B2) has been occupied, conveyor belt 2 is started and the crate is transported to the next sensor (B3). After leaving the sensor (B3), the crate lands on the ramp and the system switches off.

Connection:

- The start button (S1) is wired as a normally open contact and delivers a 0 signal when not actuated.
- The light barriers (B1-B3) provide 0 signal when the packet interrupts the light beam.

Ein-/Ausgangsbelegung

Die Ein- und Ausgänge des Modells sind wie folgt belegt (die Bezeichnung Ein- bzw. Ausgang bezieht sich dabei jeweils auf die angeschlossene Steuerung):

Eingang Nr.	Factory IO	PLC-Variablenname		Beschreibung
1	S1	I_Start	:BOOL	Start Taster (Schließer)
2	B1	I_Sensor_1	:BOOL;	Sensor B1 (Lichtschranke)
3	B2	I_Sensor_2	:BOOL;	Sensor B2 (Lichtschranke)
4	B3	I_Sensor_3	:BOOL;	Sensor B3 (Lichtschranke)

Ausgang Nr.	Factory IO	PLC-Variablenname		Beschreibung
1	Conveyor 1 ON	O_Conveyor_1_ON	:BOOL;	Förderband Eingang ein
2	Conveyor 2 ON	O_Conveyor_2_ON	:BOOL;	Förderband Ausgang ein
3	Load Package	O_Load_Package	:BOOL;	Paket einlegen

5.Process Modeling in Selmo Studio

Relevant tutorials for the model are presented in the next chapter. To get an in-depth insight into the Selmo Studio, you can take the course "Sequence Logic Modelling - The New Way of PLC Programming - Start Now!". These tutorials will support you in practical application and deepen your understanding of working with the Selmo Studio.

To be able to carry out the course, all you have to do is click on the following link and book the course for free.

Link: Sequence Logic Modelling - The new way of PLC programming - Start now!

For a better overview and detailed analysis, the process model should be viewed directly in Selmo Studio, where the logic layer and the system layer are fully visible and comprehensible.

Before you move on to the practical implementation, you should also look at the instructions in the help center. This documentation will provide you with important basics and helpful tips for working in the Selmo Studio.

After reviewing the documentation, you can test the downloaded process model in real time. You can start the simulation of the plant and check the interaction between the process model and the digital twin. Use the created document as an aid to implement what you have learned independently in Selmo Studio.

Good luck with the practical application!