Labrapport TTK4175

Group 22
Student Vebjørn Wøllo
Student Magne Angvik Hovdar

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Department of Engineering Cybernetics

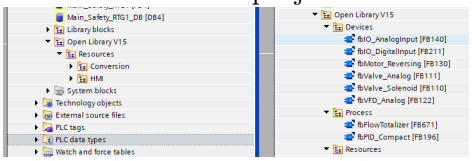
Contents

1 Leca-lab

1.1 Initialisation

1.1.1 Devices and networks

The devices in this project are



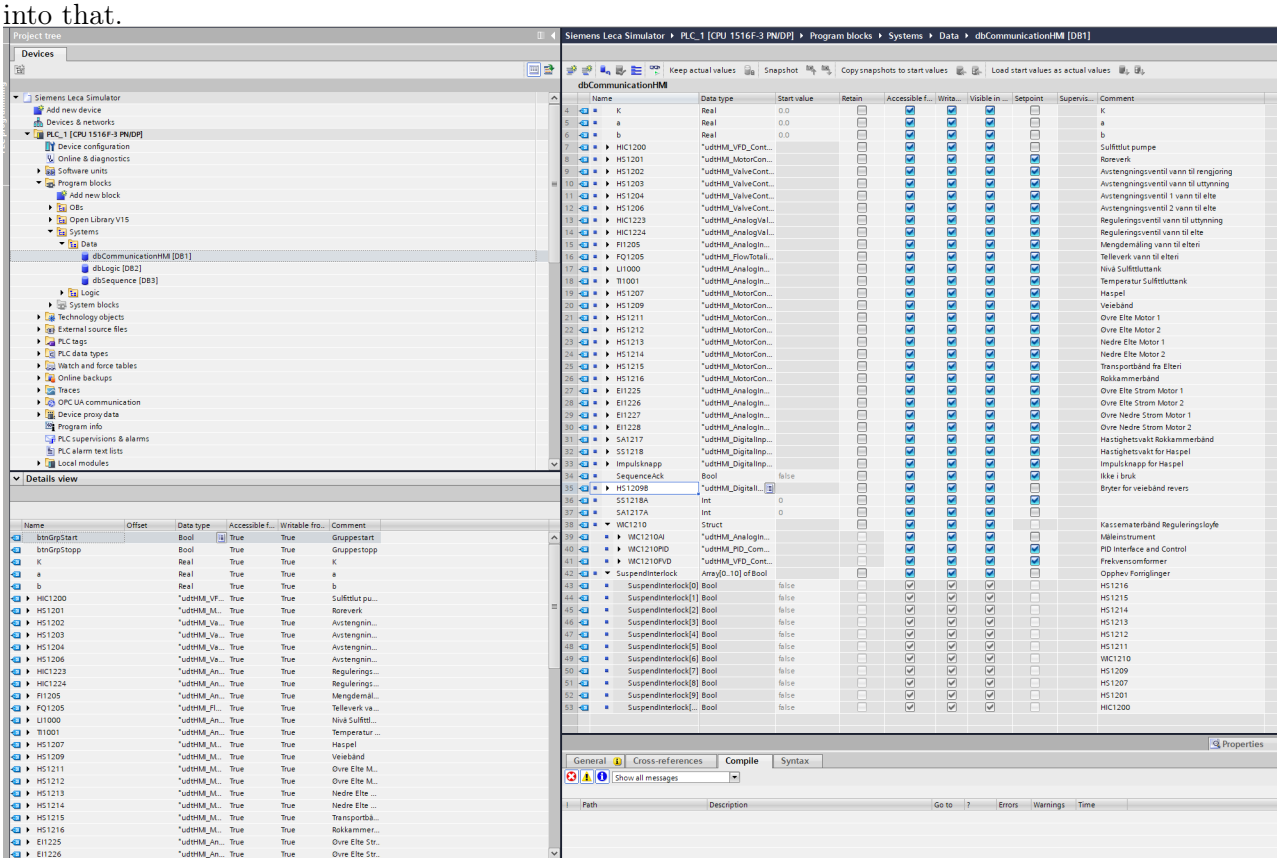
We did not have any devices in the "Siemens Motorstyring" lab.

1.1.2 PLC-tags

We added the missing addresses from the excel file by using the schematics, then we imported them into TIA-Portal.

1.1.3 CommunicationsHMI

We added the file dbCommunicationHMI and copied the necessary values into that.



1.1.4 Q1

According to the IEC 61131-3, a function is what we would call a "pure function" in programming terms. It returns a logical answer based on inputs without actually changing memory or states. A function block is a funtion that utilizes memory or current states and has the ability to trigger actuators.

1.1.5 Q2

The array signals are interlocks that makes different states dependent on eachother. We have the possibility to suspend these interlocks in the HMI by activating the suspension.

1.2 Logic

1.2.1 Q1

If HS1207 is broken, then "Varsellampe" will never turn on. See the figure for how the syntax is enabled. Varsellampe requires a signal from HS1207.

```
    //Hastighetsvakt Røkkammerbånd
    IF "dbConveyorSystem".SS1218.bOutFallingEdge = TRUE AND "dbCommunicationHMI".HS1207.bSignalForward THEN
        #ErrorTrig := TRUE;
        #ErrorStep := 7;
        #BlinkOn := True;
        #VarsellampeOn := True;
        "dbCommunicationHMI".SS1218A := 1;
    END_IF;

END_REGION
```

1.2.2 Q2

If the Error code for HS1214 is activated and the motors are in "group mode", then HS1211 and HS1212 won't start. We were not able to find the syntax for this interlock in the program.

1.3 Sequences

We completed the start sequence for the conveyor belts.

1.3.1 Differences between start and stop

We assume the start sequence starts the conveyer belts from the bottom and up while the stop sequence has to stop them from the top and down. The stop sequence also has longer time intervals between the stops.

1.3.2 Differences between error and normal sequences

The error sequence has only timers

1.3.3 Error compared to tb. 4

The error sequence follows the same path as the start sequence as far as we understand it. When reading table 4 "from the bottom and up", we recognize the pattern sequence 3 checks in. 14 can't start if 15 isn't running. 15 can't start if 16 isn't running and so on.

1.3.4 OBs

The OB is used as an interface between our functions and function blocks and the operating system. We need a main loop that can execute the programs we wish to run. The PLC reads the program from the top and down.

1.3.5 DB

Since the function blocks have memory (in contrast to functions), the memory needs to be represented by a datablock.

1.3.6 Main

The main organizational block will cycle through until the PLC is shut down. It can be interprete as a while(true) block.

1.3.7 Time

The amount of time for each cycle through main depends on what happens inside every other network that is being called on. So this will change for every cycle for example if we have to wait for a signal from something external.

1.4 Conveyor system

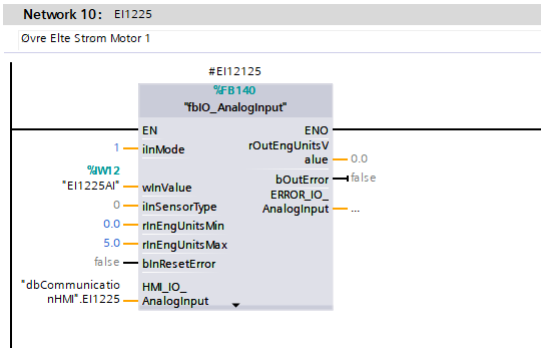
1.4.1 Network 2

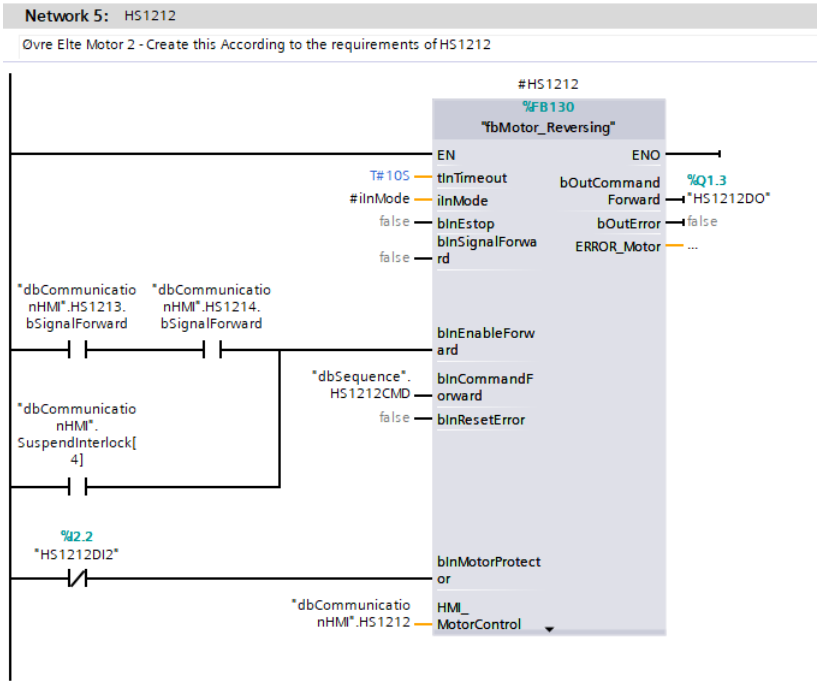
Network 2 sets 09 active only if 11 and 12 are active. This is as described in table 4.

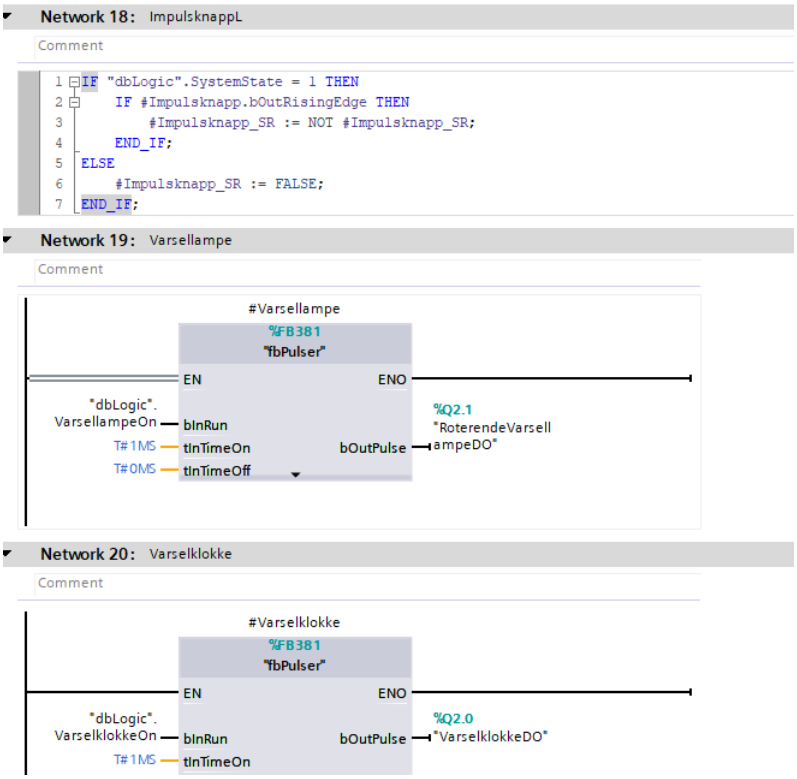
1.4.2 Interlocksignal

The interlock suspend signal is connected in parallell to the motor dependencies. This means that if the interlock is suspended, we can start the motor idependently. This is exactly what we would think suspending an interlock would do.

We finished the necessary networks as described in the task. See the figures for how we implemented this. Check the evaluation bit for some feedback concerning this task.



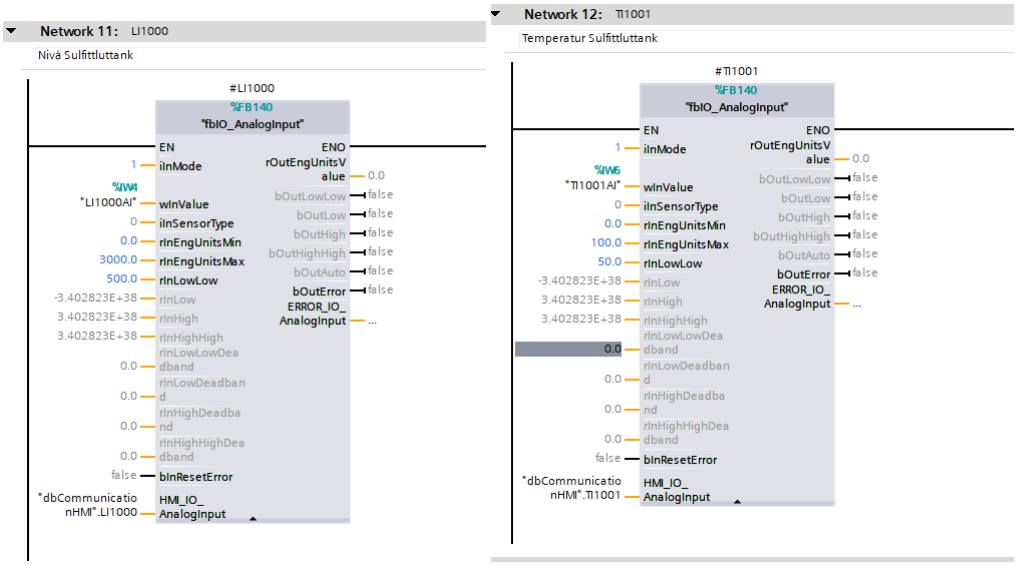




1.5 Water system

1.5.1 Low/high-alarms

The low/high alarms for the level and temperature in the sulfatetank is defined as the input "rinLowLow" and "rinHighHigh" in the function blocks LI1001 and TI1001. The minimum temperature allowed in the tank is 50° Celsius.



1.5.2 Normally open/closed

Normally open means that in a "rest" state, the valve will be open and fluid can flow through it. For example when the control signal is lost, or there is no power. Normally closed is the opposite, when the control signal is lost, the valve closes and no liquid can flow through.

1.5.3 Creating blocks

We added fbConveyorystem and fbWaterSystem to the main program cycle in network 4 and 5.

1.6 Cyclic Interrupts

1.6.1 Creating blocks

We created the cyclic interrupt block and the datablock for it.

1.6.2 PID

The process value is the weight on the conveyor belt (WT1210). The actuator is the motor running the first conveyor belt. Since the PID is a feedback controller, it regulates the speed on the belt behind the weight.

1.7 HMI system

1.7.1 Alarms

Other alarms we could have in the HMI are low/high-alarms for temperature and levels in the tank.

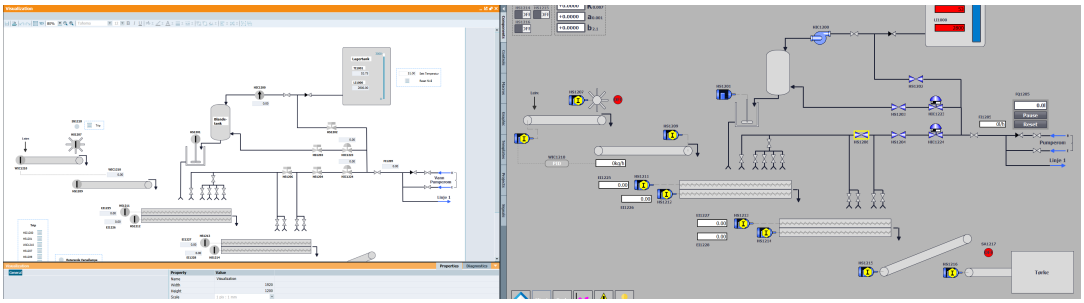
1.8 Leca-simulator

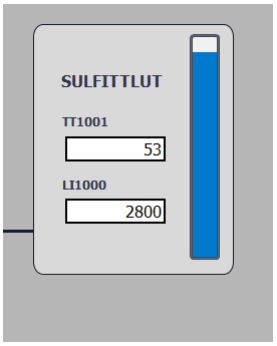
1.9 Alarm

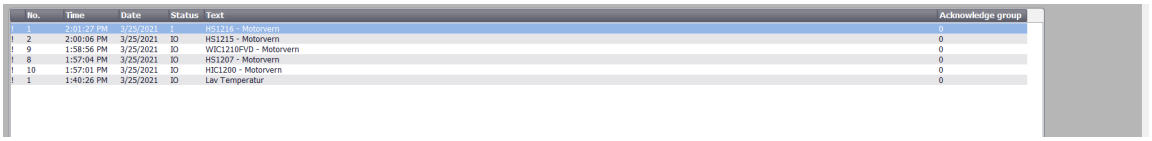
The alarm was turned off at 51° Celsius because the low-alarm is set at 50° Celius.

1.9.1 Simulating

We were not able to set valve HS1206 in auto mode, or start the motors. So we could not tune the PID to 21000kg/hour. We could not test the interlocks for motors upstream, since we were not able to start them. We did however, play around as much as possible and did what was possible. The temperature worked fine and independent alarms worked as expected. Pictures are attached. When tripping SS1218 we can see that HS1207 stops.







	No.	Time	Date	Status	Text	Acknowledge group
!	1	2:01:27 PM	3/25/2021	I	HS1216 - Motorvern	0
!	2	2:00:06 PM	3/25/2021	IO	HS1215 - Motorvern	0
!	9	1:58:56 PM	3/25/2021	IO	WIC1210FVD - Motorvern	0
!	8	1:57:04 PM	3/25/2021	IO	HS1207 - Motorvern	0
!	10	1:57:01 PM	3/25/2021	IO	HIC1200 - Motorvern	0
!	1	1:40:26 PM	3/25/2021	IO	Lav Temperatur	0

1.10 Evaluation

Check if the template is correct, especially FBConveyor system. Network 2 seems incomplete and network 3 seems to be done already, even if the task says to do it. Sometimes it seems that certain things are missing from the template, and other times things that we are asked to make are already there in the template. Starting from the HMI section, large parts of the exercises seem to already have been completed. We re-downloaded a fresh template from blackboard to make sure nobody had overwritten their changes so this applies to that template as well. We went through the exercises anyway to make sure everything worked as intended. The rest of the template seemed to work nicely.