

HMI Mini-FLUFFY Implementation

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Introduction

In this document, we describe how we developed an HMI using WinCC RT Advanced. The initial proof-of-concept (PoC) demonstrated our ability to read sensor data from the PLC and display it on the HM.

We presented the Mini-FLUFFY system in black and white, using red and green indicators for sensors: circles for magnetic sensors, boxes for solenoids, and rectangles for buffer stations/induction sensors. We also made a design for future implementation, because we didn't have enough time to finish.

WinCC RT Advanced

We used WinCC RT Advanced to create the HMI since we don't have a physical Siemens HMI screen to configure with the PLC. Although it is possible to simulate the HMI screen, we chose to work with this option. As detailed in the HMI research document, we configured the PLC tags to visually display the variables on the HMI.

First PoC

The first proof-of-concept aimed to demonstrate our ability to read sensor information from the PLC and display it on the HMI, which was also the sprint goal for the HMI.

We decided to present the Mini-FLUFFY system in black and white, with sensors displayed in red or green for clarity:

- **Magnetic sensors** are represented as circles, with red indicating no pallet on the sensor and green indicating a pallet on the sensor.
- **Solenoids** are depicted as boxes, with green indicating the actuator is up and red indicating the actuator is down.
- **Buffer stations/induction sensors** are shown as rectangles, with green indicating a pallet is detected by the induction sensor and red indicating no pallet is detected.

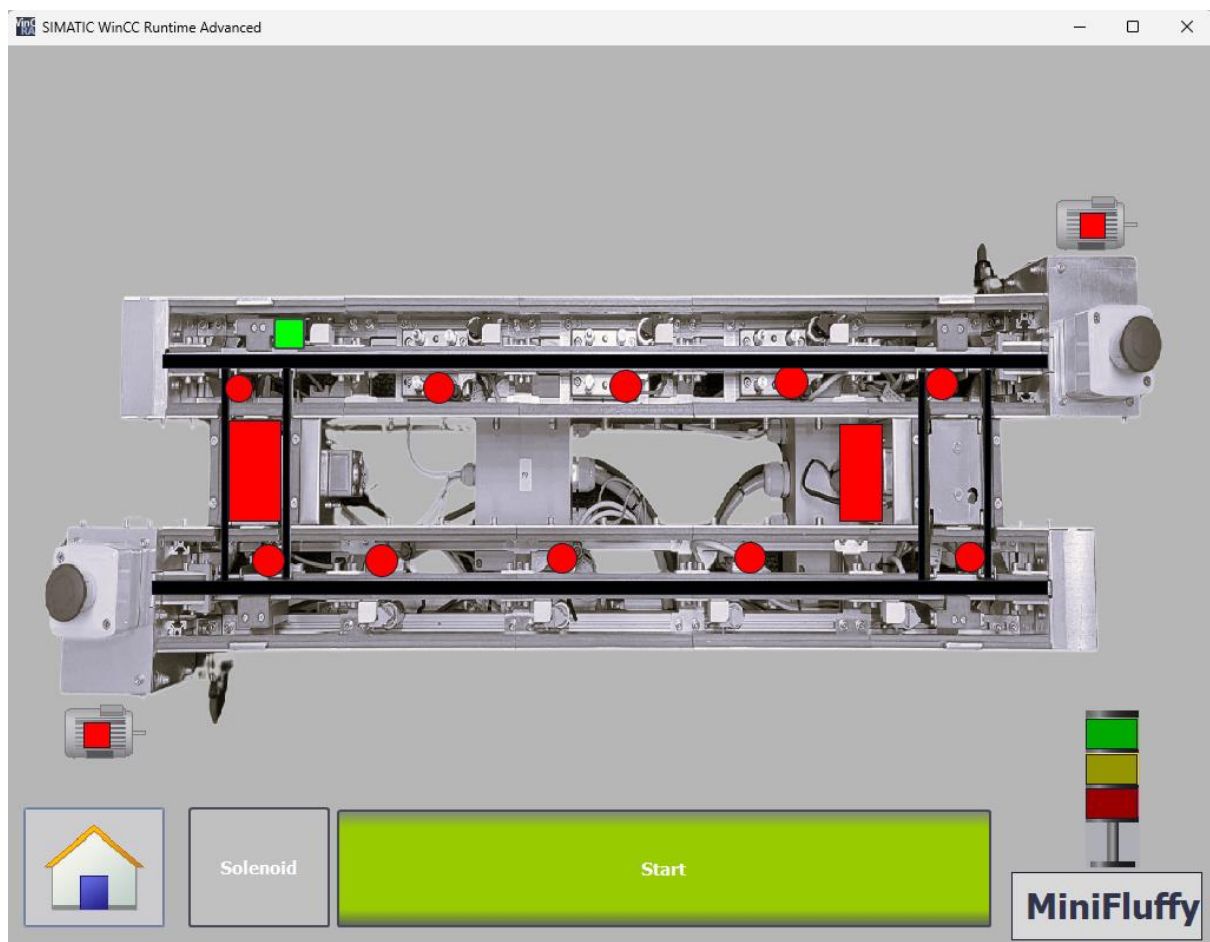


Figure 1 Version 1 of the HMI made in WinCC RT advanced

Design

After we made the PoC of the system, where we actually got the sensors visually on the HMI. We got the feedback to actually design a HMI screen, to make it more intuitive.

The screen of the first PoC is becoming our main screen, where we made everything a little bit bigger, with a counter on the screen that displays how many pallets disappeared from the system.

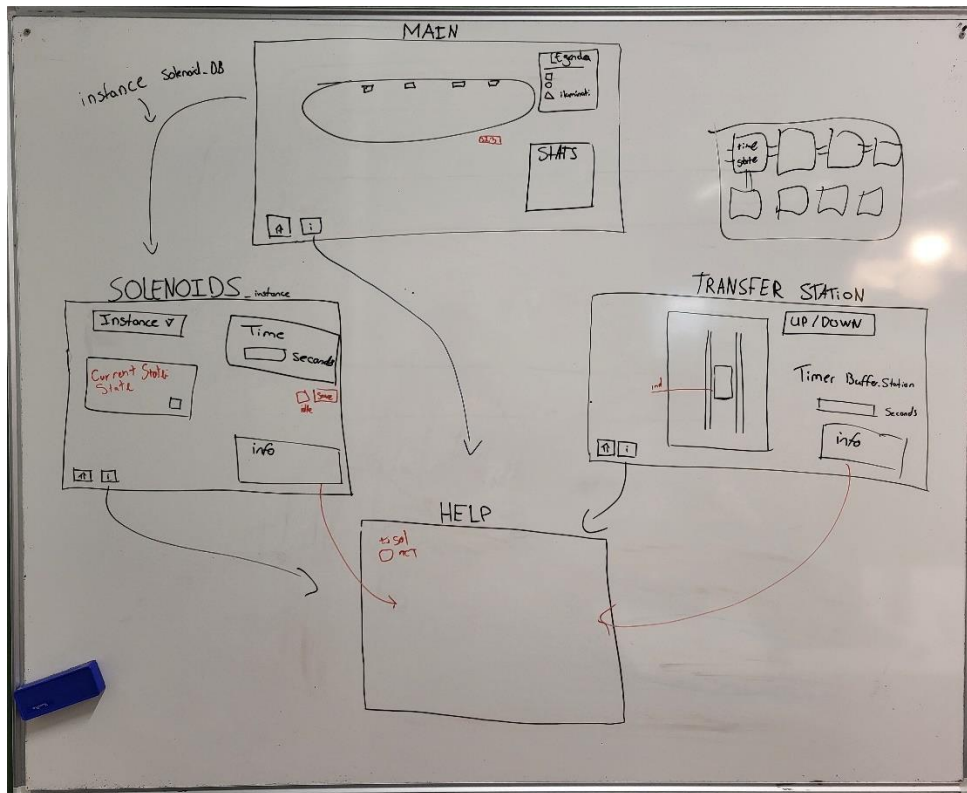


Figure 2 Design version 2 of the HMI.

In this updated design, the **solenoids** are represented as **buttons**. Each button leads to a specific solenoid screen, displaying details such as:

- Current state
- Time required for the solenoid to stay active

Similarly, the **buffer station** is also a **button**, leading to a screen that shows details of the transfer stations. On the transfer station screen, the following information is visible:

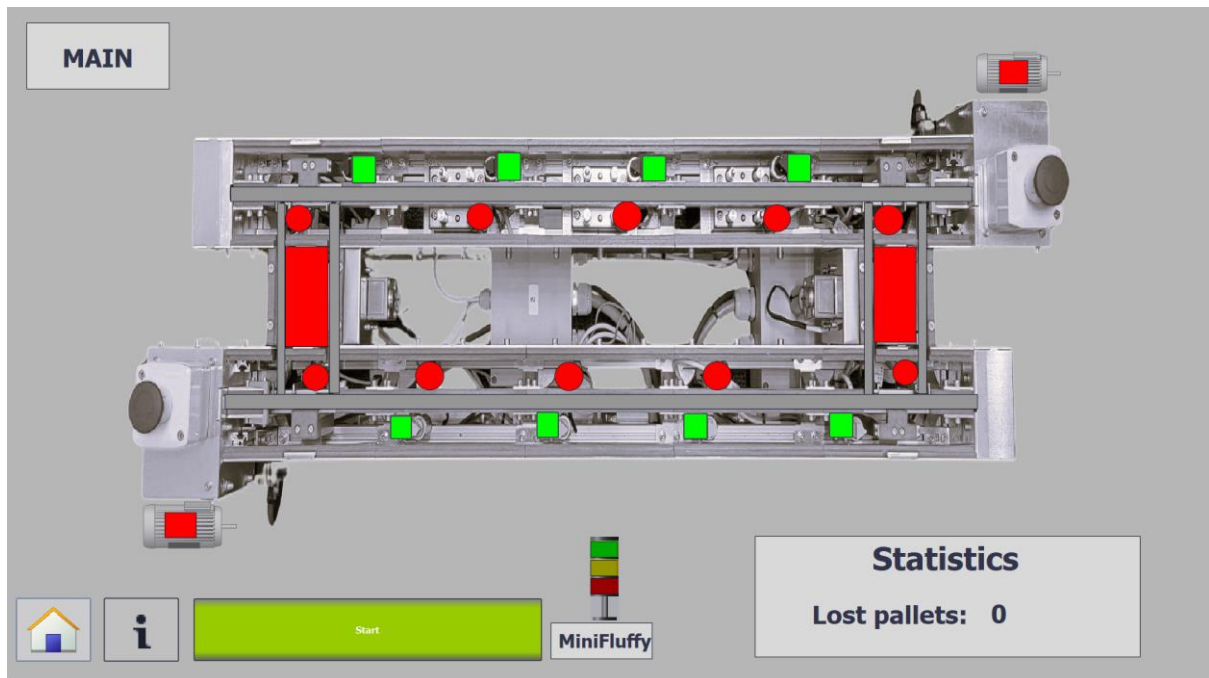
- A large depiction of the transfer station
- Status indicating whether the transfer station is up or down
- Time required for the buffer station to hold the pallet

Additionally, we received feedback to clearly label everything to ensure understanding. To address this, we believe the best way to clarify all elements is by incorporating a help/info screen.

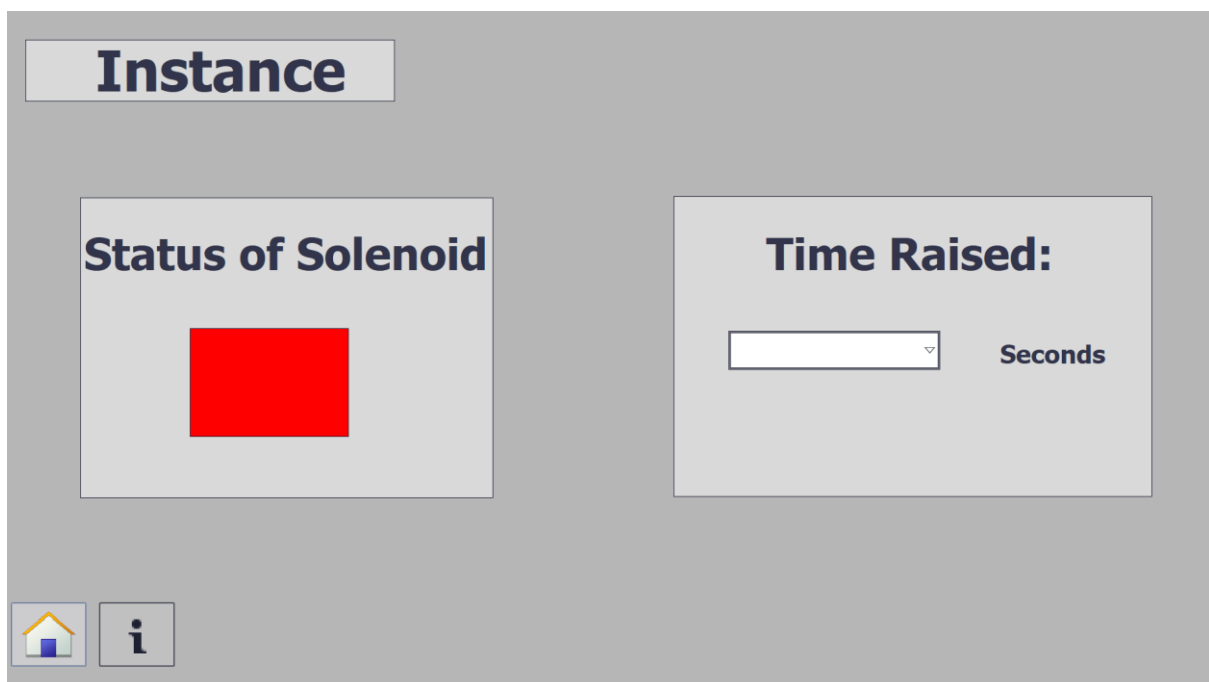
Result

Since we didn't have time to implement the instance screens of the solenoids and the transfer stations, here is just the designs in TIA portal.

Main screen:

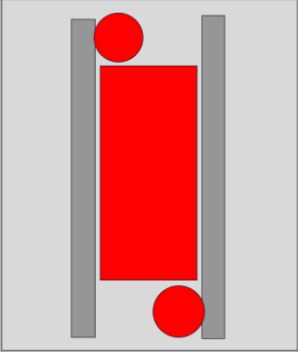


Solenoids:



Transfer Station:

Instance



State of Transfer Station

UP


DOWN

Time Raised:


Seconds

Info:


Info



Magnetic sensors are represented as circles,
with red indicating no pallet on the sensor and green indicating a pallet on the sensor.



Solenoids are depicted as boxes, with green indicating the actuator is up and red indicating the actuator is down.
The solenoids are represented as buttons.
Each button leads to a specific solenoid screen



Buffer stations/induction sensors are shown as rectangles,
with green indicating a pallet is detected by the induction sensor and red indicating no pallet is detected.
The buffer station is also a button, leading to a screen that shows details of the transfer stations.