Study Of Constraints And Familiarization With Siemens Plcs

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Abstract: Precision and safety are two very important criteria in the maritime domain, especially for ships that are still facing challenges and problems that necessarily require the integration of high-level electronic and electronic equipment and new generations [1][2]. The PLC is frequently used by floating machines for its robustness [3], accuracy and speed of controlling actuators. But even if it is powerful, like all electronic equipment PLCs have constraints in the processing and calculation of incoming information in case of a critical event caused by a staff or a technical defect [4]. This work aims to improve the technological and IT performance of one of the key machines (PLC) of ship safety. Our general goal is to start the motors and receive the information by sensors while relying on the TIA PORTA programming software followed by a machine supervision application on WINCC.

Index Terms: PLC, WINCC, IHM

1. INTRODUCTION

Visualization is registered today in the basic directory of most machines. This is why the creation of man-machine interfaces was necessary, especially if the staff is very far away to directly visualize the machine concerned [5-6]. In the case of Oriental, for example at the port of Nador, this indirect way via man-machine interface facilitates the understanding of the state or the identification of the problem following an alarm triggered, regardless of the location of the staff on the HMI boat will give an idea about what’s going on, even the pilot when he manipulates the direction of the engines and their speed the IHM offers him the necessary information on the state of oil, diesel, pressure and temperature if there are dangers [7]. There are four SIMATIC Basic Panels in Oriental Type KP300 MONO PN [8], they are controlled by the S7-1200 industrial programmable logic controller at the same time [9][10], knowing that only one API can control in maximum two HMIs according to its series of construction, then the addition of a demultiplexed communication and switching module is essential for the PLC to be able to control several HMIs in the case of Oriental the PLC controls four HMIs [11-12]. The KP300 MONO PN HMI is represented as follows: Power connector
• PROFINET interface
• Screen
• Command keys
• Notches for fixing claws
• Function key
• Assembly seal
• Designation of the interface
• Functional grounding

The KP300 Basic is equipped with system keys [13][16]. The system keys are subdivided into:
• Command keys
• Function keys with integrated numeric alpha keys
• The assignment of the function keys can be either global or local:
• Function keys assigned globally:
• A globally assigned function key always triggers the same action on the HMI device or PLC, regardless of the view momentarily displayed. It can be for example the activation of a view or the closing of an alarm window.
• Touches Function keys assigned locally:
• A function key that is assigned locally is unique to a view and is therefore only active in this activated view. The KP300 Basic function keys are used as the keypad of a mobile phone. Each function key is assigned several letters and special characters of the alphabet and a number. When entering a value, the available values are displayed in a menu on the screen. Each time we press the function key, the selection in the menu is moved one position to the right. At the end of the menu, the selection returns to the beginning.

Numeric and alphanumeric assignment always has the following order when entering value [14]:
1. letters, for example JKL
2. number, for example 5
3. special characters and accents (optional)

2. RESULT AND DISCUSSION

The S7-1200 Programmable automaton is characterized by more flexible and simpler programming features than any other version, knowing that the automaton that exists in Oriental to a program that supports 42 alarms by estimate. The program that exists in the SIEMENS memory card is protected by the manufacturer, so we will model and realize a program following our observation of 11 alarms and their operating principle during towing operations [15].

Step 1: For creating program we will use Tia Portal v13 software developed by the manufacturer SEIMENS, this software also supports the man-machine interface using WinCC integrated software. At first we will just create the physical support of our S7-1200 CPU 1214C DC / DC / DC...
PLC with its two modules of the external digital inputs SM 1221 DC, each with 16 digital inputs.

Step 2:

In reality we have four HMIs whereas in the Tia Portal software we have the possibility to work on a single HMI (if we had the possibility to work on four HMI this step will be repeated four times), we will use the KP300 MONO PD HMI in our program because it is embedded in the Oriental tug [17].

Step 3:

Based on the observation, we were able to identify the sensors on board the ship that are responsible for the following 11 alarms:

- Low oil pressure on generator side (1)
- High temperature generator side (1)
- Low oil pressure on the reducing side (1)
- Low oil pressure on the TD engine side and BD engine side (2)
- High temperature refrigeration on the TD engine side and BD side (2)
- Low oil level on the TD engine side and BD side (2)

The various sensors linked to the programmable logic controller their coding will be in the following form:

- %Ix.y : I : input type physical variable
- X : number of the register used (each register is 8bits)
- Y : bit number of the register used

L'utilisation d'IHM nécessite des variables de mémoire présentes dans la mémoire RAM de l'API, so each memory bit will be reserved for an alarm. The memory bits will be coded in the format %Mx.y (M : Memory, X : register number, Y : bit order), we will bring them together in two registers that are coding in the format %MWx (M : memory, W : 16bit word, X : number of the two registers) because the man-machine interface processes alarms with a 16-bit binary word [4].

- %Mx.y : M : memory type variable
- X : number of the used memory register (each register is 8 bits)
- Y : memory bit number of the used memory register

- %MWx : M : memory type variable
- W : signifie Word
- X : register number to handle with the manipulation of second register that follows it

- %MBx : M : memory type variable
- B : signifie Byte
- X : register number to handle

Example:

Step 4:

The declaration of the input variables (In put) and memory variables is done at the table of standard variables in the folder of the PLC and also in the HMI table:

- Programmable logic controller
- Human Machine Interface

Table of Variable
Put the HMI link with the API, to bind them we will use the PROFINET cable manufactured by SEIMENS, this cable is characterized by a high speed and a long range of data to be transmitted.

### Step 6:
Realization of the main program in the operational block 1 (BO1) using the LADDER language because it is more powerful than Grafcet in terms of performance, optimization and flexibility.

- **Network 1** - Oil pressure alarm on generator side:

- **Network 2** – Generator side temperature alarm:

- **Network 3** – Oil pressure alarm on the gear side:

- **Network 4** – TD Engine Oil Pressure Alarm:

- **Network 5** – TD Motor Side Temperature Alarm:

- **Network 6** – Oil level alarm on the TD engine side:

- **Network 7** – Diesel engine side level alarm:

- **Network 8** – Oil pressure alarm on the BD engine side:

- **Network 9** – BD Engine Side Temperature Alarm:
3 CONCLUSION

PLC stands for Programmable Logic Controllers. They are basically used to control automated systems in industries. They are one of the most advanced and simplest forms of control systems that are now replacing hardwired logic relays at a large scale. The PLC is frequently used by floating machines for its robustness, accuracy and speed of controlling actuators. Our goal is to improve the technology and performance of one of the key machines (PLC) of ship safety. Our job is to start the engines and to receive the information by sensors while relying on the TIA PORTAL programming software followed by a machine supervision application on WINCC.

REFERENCES

