I.Tank Filter Cleaner

i. Problem Statement

I was entrusted with creating an application during my internship with the goal of boosting tank filter cleaning's ineffectiveness. The main problem was that the cleaning procedure was either excessively time-consuming or ineffective, which resulted in maintenance issues and decreased operational efficiency. In order to solve this, I designed an automated system that consists of three main parts: choosing up to eight coils, determining the coils' operational duration, and establishing the waiting time for each coil. This solution was created to automate the cleaning procedure, guaranteeing that it was carried out methodically and effectively, therefore overcoming the earlier problems.

Managing the flexibility to handle up to eight coils and integrating this with current equipment were obstacles in the search for a solution. In order to maintain robustness and dependability, the application has to be flexible enough to accommodate modifications in timing parameters and coil counts. To prevent any interruptions to operations, it also needed to be smoothly integrated with the machinery that is already in place. To guarantee the system's efficacy, balancing these aspects needed exact programming and extensive testing.

Previously, manual techniques or more general automation systems would have been used to do comparable tasks. This project marked a change because it used an intern-developed cleaning process-specific solution. Although engineers have previously completed comparable tasks, this time the emphasis was on utilizing intern contributions to use U90 Ladder programming to construct a unique automated solution. This strategy showed that the organization was moving toward more practical problem-solving.

Similar problems are usually handled in other national and multinational businesses by sophisticated automation systems with extensive control features. Complex PLCs and control panels are used in these systems to regulate variables like timing and coil count. Although approaches could be different, the goal is always the same: increasing cleaning effectiveness using customized and automated solutions. This guarantees that the cleaning procedure is efficient and flexible enough to meet various operational needs.

ii. Tools and Techniques Used

In order to successfully implement the tank filter cleaning system, I worked with a variety of tools and procedures during my internship at Ülker Biscuit Factory. This is a detailed rundown of all the instruments and methods used.

I used U90 Ladder to program the PLC used in the project. Its smooth integration with the current industrial systems was the primary factor in this decision. U90 Ladder is a straightforward yet effective PLC programming environment that is best suited for easier automation jobs. It did, however, provide some difficulties, especially when it came to more intricate control operations and features like timers. Options like the PLC programming software from Schneider Electric or the Siemens TIA Portal may have provided a more sophisticated feature set, including an easier-to-use interface and greater capacity for intricate programming jobs. These options might have given programmers more choice when creating and implementing control logic, as well as increased programming efficiency.

To configure the Unitronics JZ20-T40 PLC, U90 Ladder was the software tool that was utilized. With the use of this software, the control sequences required for the tank filter cleaning system could be developed. These sequences included timers, conditional logic, and management of input and output processes. The U90 Ladder had limitations in terms of functionality and user interface when compared to more recent PLC programming tools, although being sufficient for the project. Advanced capabilities like integrated diagnostics, improved visualization tools, and a more user-friendly interface might have been offered by software like Siemens TIA Portal, perhaps resulting in a more efficient development process.

The Unitronics JZ20-T40 PLC configuration required the usage of the software program U90 Ladder. The creation of the control sequences required for the tank filter cleaning system, including the management of timers, conditional logic, and input and output activities, was made possible by this software. Despite being sufficient for the job, U90 Ladder's functionality and user interface were less advanced than those of more contemporary PLC programming tools. A more efficient development process might have resulted from software like Siemens TIA Portal, which offered cutting-edge capabilities including integrated diagnostics, improved visualization tools, and an easier-to-use interface.

The Unitronics JZ20-T40 PLC was used in the project since it could fulfill the demands of the task. This PLC could manage the required input/output functions and facilitating communication with the cleaning system's control components. The JZ20-T40 was suitable, but the system's performance could have been improved by using one of the other PLCs that had more sophisticated features or more processing power. To enable more sophisticated control duties or future system expansions, for instance, a PLC with more processing capacity or more communication ports may have been used.

Ladder logic programming, which is highly recognized for its understandability and visual depiction of control operations, was the main technique employed. Ladder logic is frequently utilized in industrial automation and is especially useful for constructing simple control sequences. Ladder logic was used in this project to create the control sequences that govern the tank filter cleaning system. These sequences include wait time settings, operating duration definitions, and the management of up to eight selected coils. The restrictions of the program limited the usage of ladder logic in U90 Ladder, notwithstanding its benefits. Further advantages including expanded system integration, advanced control features, and better debugging capabilities would have been possible with more complex programming methods and software.

Overall, even if the tools and methods employed were appropriate for the project's requirements, looking into different hardware and software choices would have provided extra advantages and possibly resulted in a more effective and adaptable implementation.

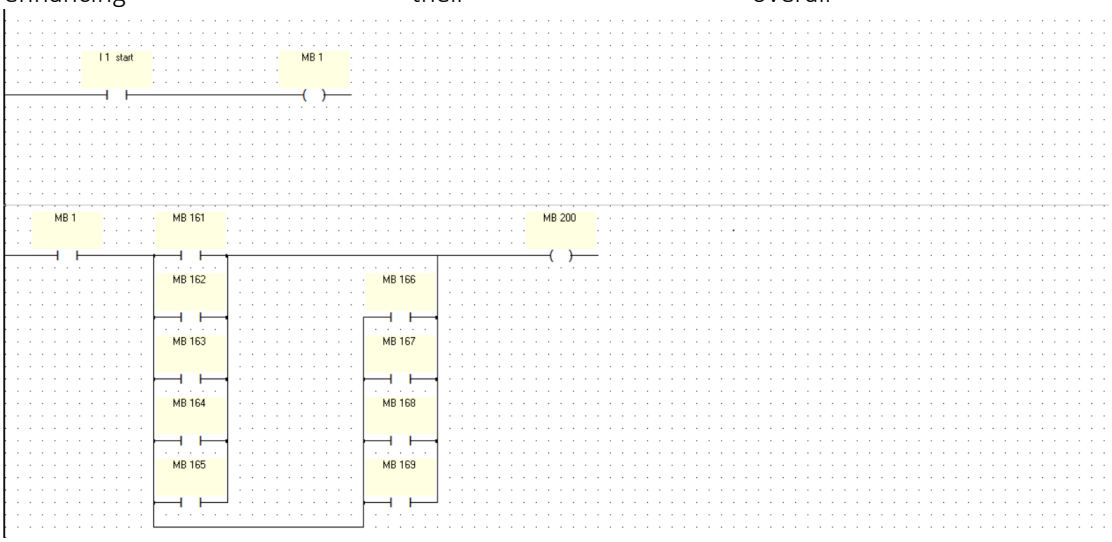
iii. Detailed Explanation

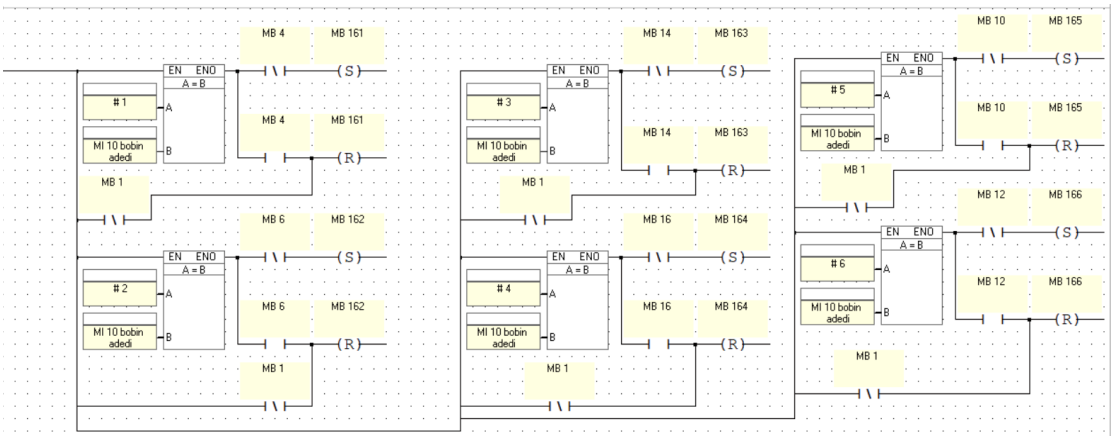
Ülker Biscuit Factory gave me the assignment of creating an automated system for cleaning tank filters during my internship. With the help of the Unitronics JZ20-T40 PLC and U90 Ladder software, the system was created to regulate up to eight coils for cleaning purposes.

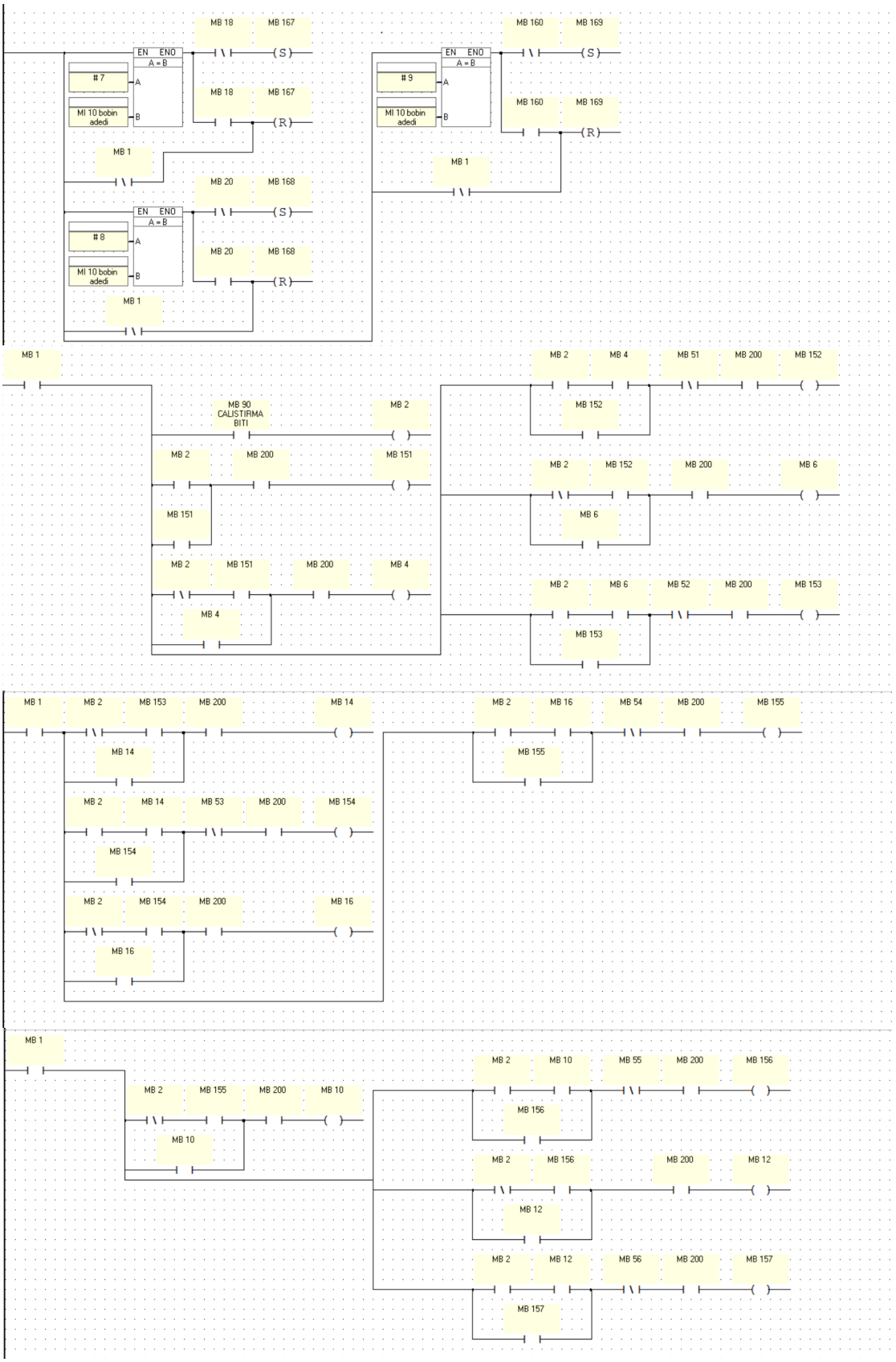
In the beginning, consumers may choose up to eight coils to operate, according to the system's architecture. To accomplish this, click the '1' button on the user interface. Users could adjust the interval between each coil's operations by pressing the '2' button, and they could customize each coil's operating period by using the '3' button. The cleaning cycle was started with the 'Start' button, and the

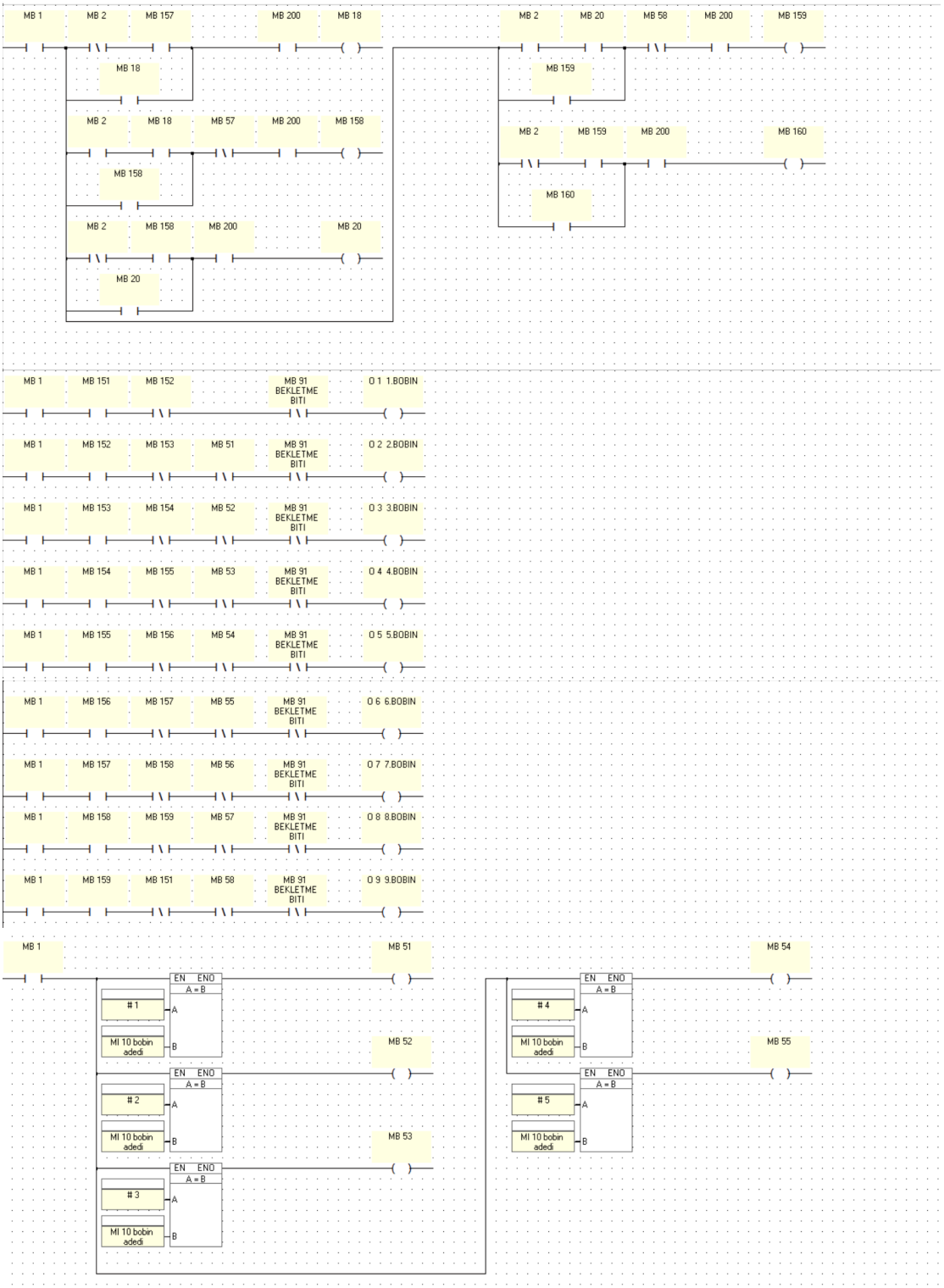
arrow keys allowed for changes to the number of coils, rest period, and working time. This easy-to-use strategy made everything flexible and simple to employ.
I used the U90 Ladder software for the implementation since it was compatible with the factory's current systems. But this program had its limitations, especially when it came to handling more sophisticated features like timers. Even though it was simple to integrate, I realized that other software programs, such as the Schneider Electric PLC apps or the Siemens TIA Portal, may have offered a more sophisticated user interface and more features. Though it satisfied the project's criteria, the Unitronics JZ20-T40 PLC was chosen based on the factory's specifications; still, investigating alternative PLC options might have provided superior performance or functionality.
Ladder logic was used to program the automation; this works well for simple control chores. But I discovered that ladder logic's ease of use also made some of its drawbacks when handling more complicated functions apparent. It could be advantageous to consider more sophisticated software environments for next projects, as they provide better capabilities and more adept handling of intricate automation chores.

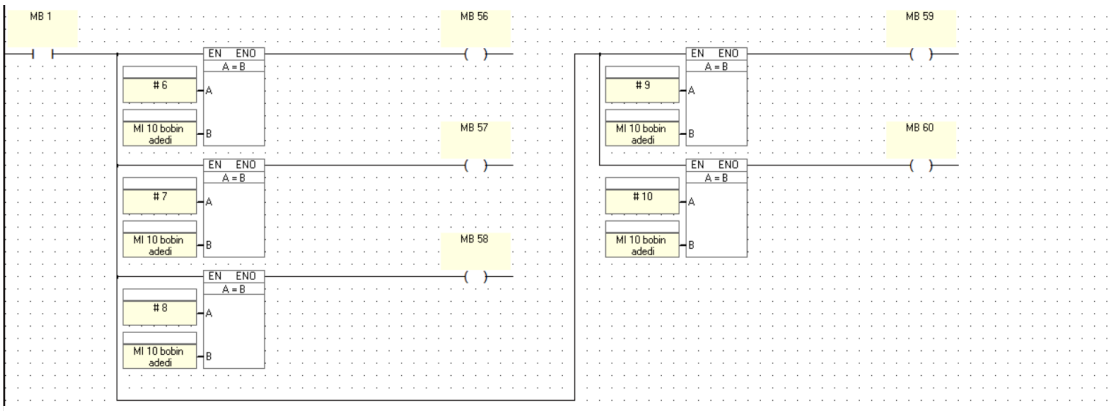
Overall, this project serves as an example of how particular instruments and methods can be applied to successfully address issues related to industrial automation. Through the provision of comprehensive implementation details, others can get valuable ideas for creating analogous automation systems and enhancing their overall efficacy.

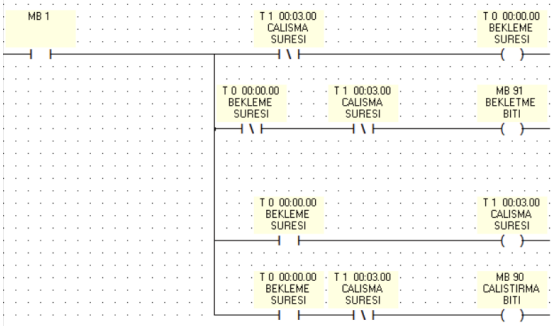


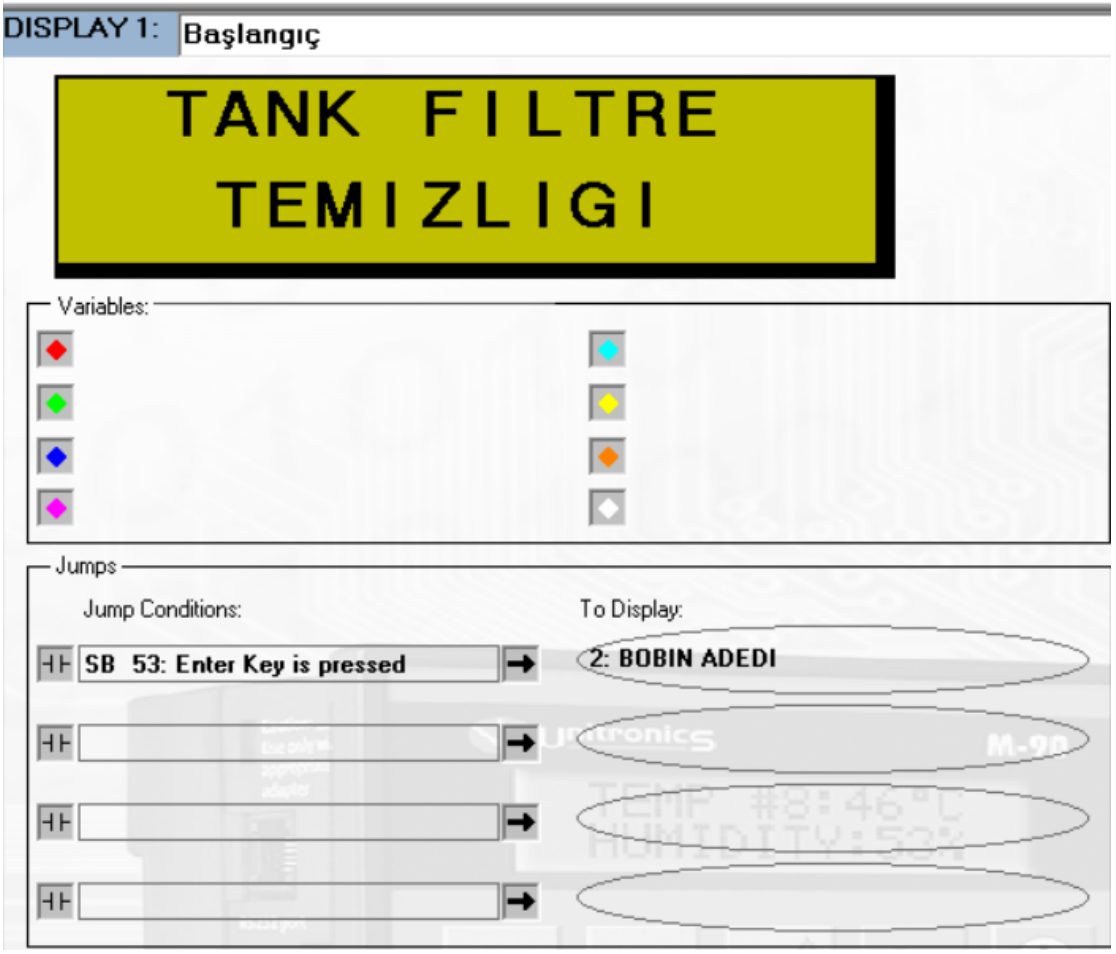



MB 18
MB 167
EN ENO
A = B
# 7
MI 10 bobin adedi
A
B
MB 18
MB 167
MB 1
MB 20
MB 168
EN ENO
A = B
# 8
MI 10 bobin adedi
MB 20
MB 168
MB 1
MB 160
MB 169
EN ENO
A = B
# 9
MI 10 bobin adedi
MB 160
MB 169
MB 1
MB 1
MB 90 CALISTIRMA BITI
MB 2
MB 2
MB 200
MB 151
MB 151
MB 2
MB 151
MB 200
MB 4
MB 4
MB 2
MB 4
MB 51
MB 200
MB 152
MB 152
MB 2
MB 152
MB 200
MB 6
MB 6
MB 2
MB 6
MB 52
MB 200
MB 153
MB 153
MB 1
MB 2
MB 153
MB 200
MB 14
MB 14
MB 2
MB 14
MB 53
MB 200
MB 154
MB 154
MB 2
MB 154
MB 200
MB 16
MB 16
MB 2
MB 16
MB 54
MB 200
MB 155
MB 155
MB 1
MB 2
MB 155
MB 200
MB 10
MB 10
MB 2
MB 10
MB 55
MB 200
MB 156
MB 156
MB 2
MB 156
MB 200
MB 12
MB 12
MB 2
MB 12
MB 56
MB 200
MB 157
MB 157


MB 1
MB 2
MB 157
MB 200
MB 18
MB 18
MB 2
MB 18
MB 57
MB 200
MB 158
MB 158
MB 2
MB 158
MB 200
MB 20
MB 20
MB 2
MB 20
MB 58
MB 200
MB 159
MB 159
MB 2
MB 159
MB 200
MB 160
MB 160
MB 1
MB 151
MB 152
MB 91 BEKLETME BITI
O 1 1.BOBIN
MB 1
MB 152
MB 153
MB 51
MB 91 BEKLETME BITI
O 2 2.BOBIN
MB 1
MB 153
MB 154
MB 52
MB 91 BEKLETME BITI
O 3 3.BOBIN
MB 1
MB 154
MB 155
MB 53
MB 91 BEKLETME BITI
O 4 4.BOBIN
MB 1
MB 155
MB 156
MB 54
MB 91 BEKLETME BITI
O 5 5.BOBIN
MB 1
MB 156
MB 157
MB 55
MB 91 BEKLETME BITI
O 6 6.BOBIN
MB 1
MB 157
MB 158
MB 56
MB 91 BEKLETME BITI
O 7 7.BOBIN
MB 1
MB 158
MB 159
MB 57
MB 91 BEKLETME BITI
O 8 8.BOBIN
MB 1
MB 159
MB 151
MB 58
MB 91 BEKLETME BITI
O 9 9.BOBIN
MB 1
MB 51
EN ENO
A = B
# 1
A
MI 10 bobin adedi
B
MB 52
2
MB 53
3
MB 54
4
MB 55
5


MB 1
MB 56
EN ENO
A = B
# 6
MI 10 bobin adedi
A
B
MB 57
7
MB 58
8
MB 59
9
MB 60
10


MB 1
T 1 00:03.00 CALISMA SURESI
T 0 00:00.00 BEKLEME SURESI
MB 91 BEKLETME BITI
MB 90 CALISTIRMA BITI


DISPLAY 1: Başlangıç
TANK FILTRE
TEMIZLIGI
Variables:
Jumps
Jump Conditions:
To Display:
SB 53: Enter Key is pressed
2: BOBIN ADEDI

DISPLAY 2: BOBIN ADEDI

Variables:

1 -

Jumps

Jump Conditions:	To Display:
SB 53: Enter Key is pressed	3: BEKLEME SURE
SB 51: Left Arrow Key is pressed	1: Başlangıç

DISPLAY 3: BEKLEME SURE

Variables:

2 -

Jumps

Jump Conditions:	To Display:
SB 53: Enter Key is pressed	4: CALISMA SURESI
SB 51: Left Arrow Key is pressed	2: BOBIN ADEDI

DISPLAY 4: CALISMA SURESI

Variables:

7 -

Jumps

Jump Conditions:	To Display:
SB 53: Enter Key is pressed	1: Başlangıç
SB 51: Left Arrow Key is pressed	3: BEKLEME SURE

VARIABLE 1:

Variable Type
- ○ Bit (on/off)
- ◉ Integer (Numeric value)
- ○ Timer
- ○ Time Functions
- ○ List
- ○ Date & Time

Link To:

Link To | MI 10

bobin adedi

Variable information

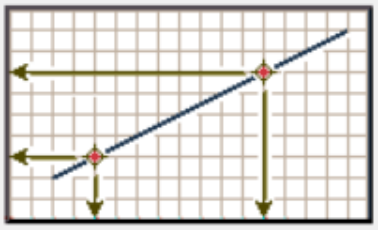
Format: xxxxx

- ☐ Leading Zeros
- ☑ Keypad Entry
- ☐ Start with clear field

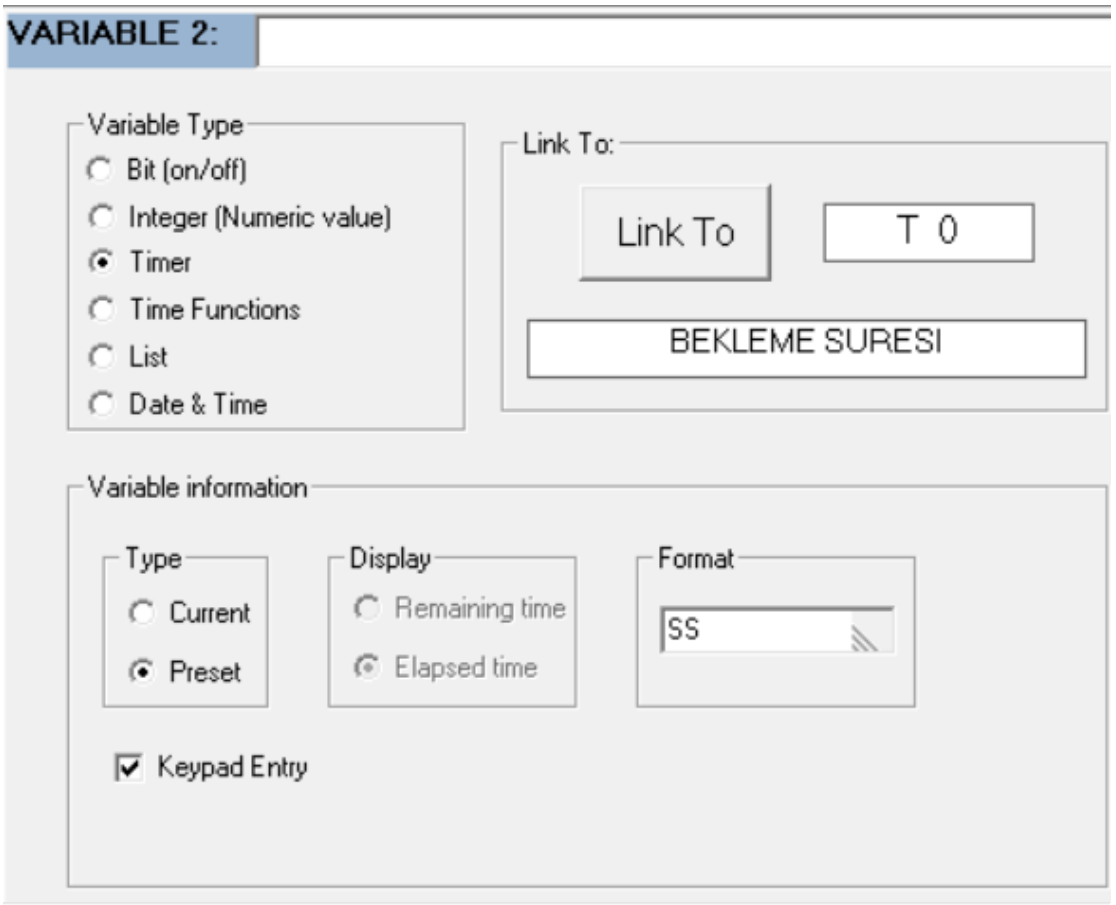
Entry limits
- ☑ Enable limits
- Min: 1
- Max: 9

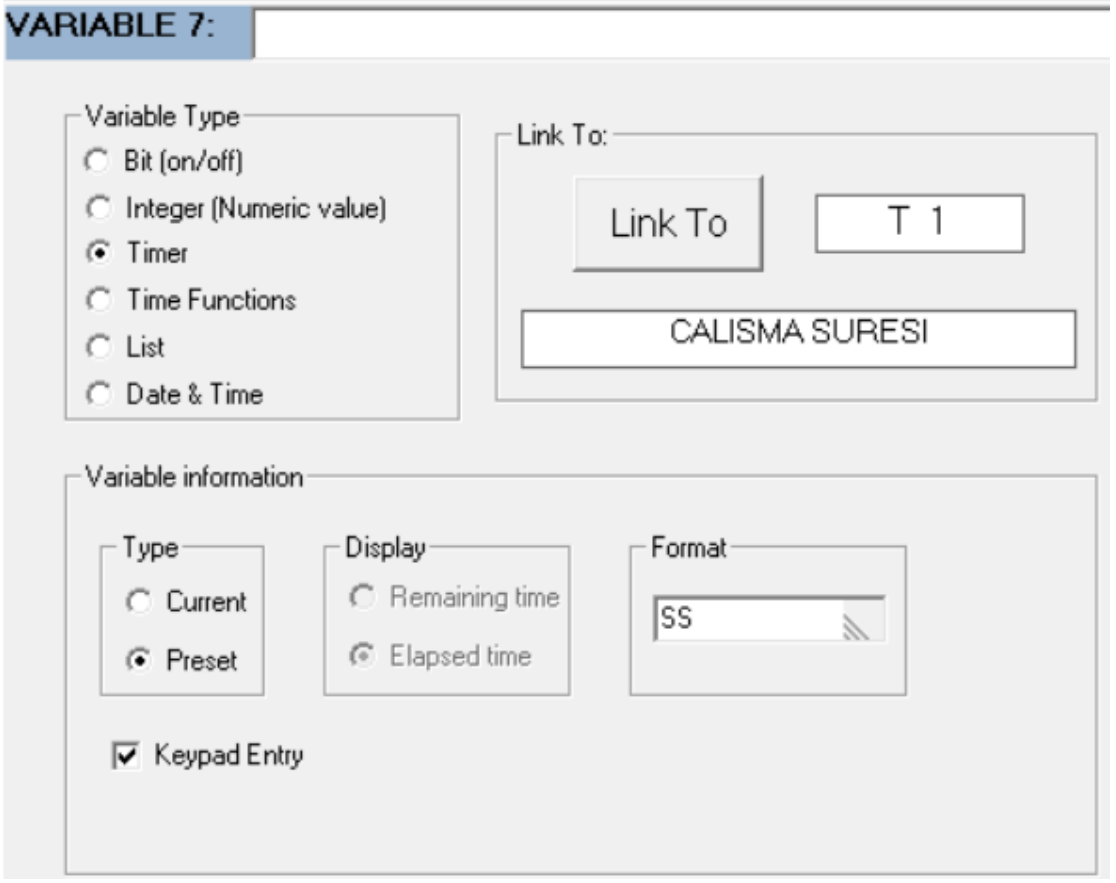
☐ Enable linearization

Display
- 32767
- 0



MI Value
- 0
- 32767


VARIABLE 2:
Variable Type
Bit (on/off)
Integer (Numeric value)
Timer
Time Functions
List
Date & Time
Link To:
Link To
T 0
BEKLEME SURESI
Variable information
Type
Current
Preset
Display
Remaining time
Elapsed time
Format
SS
Keypad Entry


VARIABLE 7:
Variable Type
Bit (on/off)
Integer (Numeric value)
Timer
Time Functions
List
Date & Time
Link To:
Link To
T 1
CALISMA SURESI
Variable information
Type
Current
Preset
Display
Remaining time
Elapsed time
Format
SS
Keypad Entry

Inputs

Op	Addr	In Use	Value	Symbol
I	0	☐		
I	1	☑		start
I	2	☐		stop
I	3	☐		karton kutu algılama sensoru
I	4	☐		limit üst
I	5	☐		limit alt
I	6	☐		B
I	7	☐		deneme

Outputs

Op	Addr	In Use	Power Up	Value	Symbol
0	0	☐			
0	1	☑			1.BOBIN
0	2	☑			2.BOBIN
0	3	☑			3.BOBIN
0	4	☑			4.BOBIN
0	5	☑			5.BOBIN
0	6	☑			6.BOBIN
0	7	☑			7.BOBIN
0	8	☑			8.BOBIN
0	9	☑			9.BOBIN

Memory Integers

Op	Addr	In Use	Power Up	Value	Symbol
MI	0	☐			donme tur sayisi
MI	1	☐			[Store B]
MI	2	☐			[Store B]
MI	3	☐			[Store B]
MI	4	☐			[Store B]
MI	5	☐			[Store B]
MI	6	☐			[Ge A]
MI	7	☐			
MI	8	☐			
MI	9	☐			
MI	10	☑			bobin adedi
MI	11	☐			BOBIN ADEDI

Timers

Op	Addr	In Use	Preset	Resolution	Value	Symbol
T	0	☑	00 : 00 : 02 . 00	10 ms		BEKLEME SURESI
T	1	☑	00 : 00 : 03 . 00	10 ms		CALISMA SURESI

iv. Results

The Ülker Biscuit Factory's initiative to create an automated system for cleaning tank filters was successfully finished, meeting all the main goals. Up to eight coils may be controlled by the system, giving operators the ability to choose how many coils to use, how long to let each coil run for, and how much time to rest between operations. After extensive testing, the system proved to be dependable in its performance, efficiently overseeing the cleaning procedure within the given constraints. The Unitronics JZ20-T40 PLC was used in the project, and U90 Ladder software was used for programming. Even though U90 Ladder had many drawbacks, especially when it came to more sophisticated features like timers, the system handled its primary duties well.

The project met its quantitative objectives by precisely timing and resting intervals, controlling up to eight coils with accuracy, and offering an intuitive interface for simple modifications. Positive comments were received from coworkers and supervisors, who emphasized how easy it was to use and how well the system handled the cleaning procedure. Even though the project was not carried out in the factory because my internship was coming to an end, the created system complied with design standards and

was prepared for real-world use. To demonstrate the system's usability and functionality, screenshots of the user interface and operational outcomes were taken. All things considered, the project was successful in achieving its functional and qualitative goals, and the knowledge acquired provides insightful direction for future improvements in industrial automation systems.