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INTERNSHIP REPORT

Host organization : Sebn TN

SOLUTION WITH AUTOMATIC GUIDED AGV VEHICLES

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DEDICATED

To

We can never say it enough, a big thanks to all the corporations, doctors, nurses, caregivers, all medical staff, who are fighting against Covid 19.
A big thanks for your commitment and all you do to save lives.

MERCI

THANK YOU

DANKE

ありがとうございました

Special thanks to

First of all, I want to thank **"GOD"**

Before embarking on any development on this professional experience, it seems opportune to start with sincere thanks to the people who were kind enough to participate directly or indirectly to this effect.

The realization of this internship report was made possible thanks to the Contribution of several people to whom I would like to express My gratitude.

I would like to express my deep respects and gratitudes to the internship director of my school: **National School of Engineers of Sfax** which offered me the chance to carry out this internship in order to enrich my theoretical knowledge in Electrical Engineering with practical experience and to discover the professional environment.

Likewise, I address my sincere thanks to the executives, managers, technicians and workers of **Sebn TN** who have helped me enormously in drawing up this report in a serious and dynamic atmosphere.

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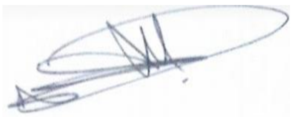
Finally, I would like to thank the entire faculty of the National School of Engineers of Sfax for the efforts made to provide a training that is as complete as it is enriching.

KHAZRI Ghazi
ENIS, 2020



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GENERAL INTRODUCTION

Nowadays, industrial activities multiply and companies count multiple needs in terms of productivity and industrial performance, under the traditional constraints of the budget and the respect of the deadline, while ensuring an acceptable cost for the customer. Therefore, to remain competitive, it is essential to automate systems that perform repetitive tasks, and save in terms of manpower.

In this sense, and to confirm its presence on a national and international scale and to maintain its position among the market leaders of automotive electric cable producers, Sebn TN has deployed all industrial and managerial resources to ensure such goal.

Man has always and by various means tried to increase his productive capacity and to free himself from monotonous and muscular work. With this in mind, he has built ever more sophisticated machines that can perform complex functions.

The considerable development of technology now makes it possible to produce vehicles "without operator" called automatic guided vehicles or AGVs.

In general, the automation of these vehicles aims to minimize operator intervention, especially in hostile environments. This is the case, for example, in the chemical and nuclear industries. These vehicles have a major advantage in terms of reliable operation and a relatively low cost price.

For a number of years, AGVs have become an integral part of flexible workshops. Due to their ability to transport more or less heavy loads through an often complex path, AGVs are essential elements of these workshops.

It is in this perspective that my case study of this internship, which focuses on a solution with automatic guided vehicles agvs.

My report is structured into **3 chapters** which reflect the approach I took in developing this report.

The first chapter “Presentation of the company", in which I will describe the company.

The second chapter “production cycle” is devoted to the description of the production cycle.

The third chapter is devoted to the case study entitled "SOLUTION WITH AUTOMATIC GUIDED VEHICLES AGV".

CHAPTER I

PRESENTATION OF THE COMPANY

INTRODUCTION

This chapter will be the subject of an overview of the **"SEBN TN"** in general. As well as its departments and a description of its production process.

1. PRESENTATION OF THE COMPANY

1.1 Company structure

Founded in December 1919, the SUMITOMO group is one of the largest industrial and financial groups in the world. It is present in various sectors including electrical, electronics and commerce. This Japanese empire is made up of 37 companies and in 2007 ranked among the top five global business groups. The different companies are autonomous for management and legal status.

Present in 65 countries, SUMITOMO employs more than 153,000 people and in 2011 achieved gross profit of approximately $ 11.5 million USD.

In the automotive sector of Sumitomo Electric Industries, there are 4 main companies:

- Sumitomo Wiring Systems
- AutoNetworks Technologies
- Tokkai Rubber Industries
- Sumiden Electronics

SUMITOMO ELECTRONIC BORDNETZE Tunisia Sarl is a cable company which started its activities in (Jendouba) since March 2009 on an industrial space of approximately 2,500 m².

Specialized in the production of electric cables for the automotive industry, its overall investments are estimated at nearly 25 million USD and the number of jobs created is close to 500 (in 2011).

Figure 1: SEBN TN premise in Erttiyeh-Jendouba

1.2 Company indicators

The evolution of turnover and number of employees reflects the prosperous growth of Sumitomo Electric Bordnetze from its foundation until today.

Figure 2: The evolution of turnover between the years 1987 and 2011

Figure 3: The evolution of the number of employees between the years 1987 and 2011

2. IDENTIFICATION SHEET

Table 1: Identification sheet

Company name	SUMITOMO ELECTRIQUE BordNETEZ-TUNISIA
The head office	Irtiye7 Jendouba Industrial Zone
Share capital	C.a.1.770.000B
Field of activity	Manufacture of cable harnesses for the automotive industry
Market type	totally exporting
Initial product	Cable module for VW Passàt, Seat, Skoda
Principal clients	SEBN-SK
Main suppliers	SEBN-BG, SEBN-TR
Shareholders	Volkswagen
Creation date	17 /09/2008
Starting production	15/03/2009

3. SEBN GROUPS AROUND THE WORLD

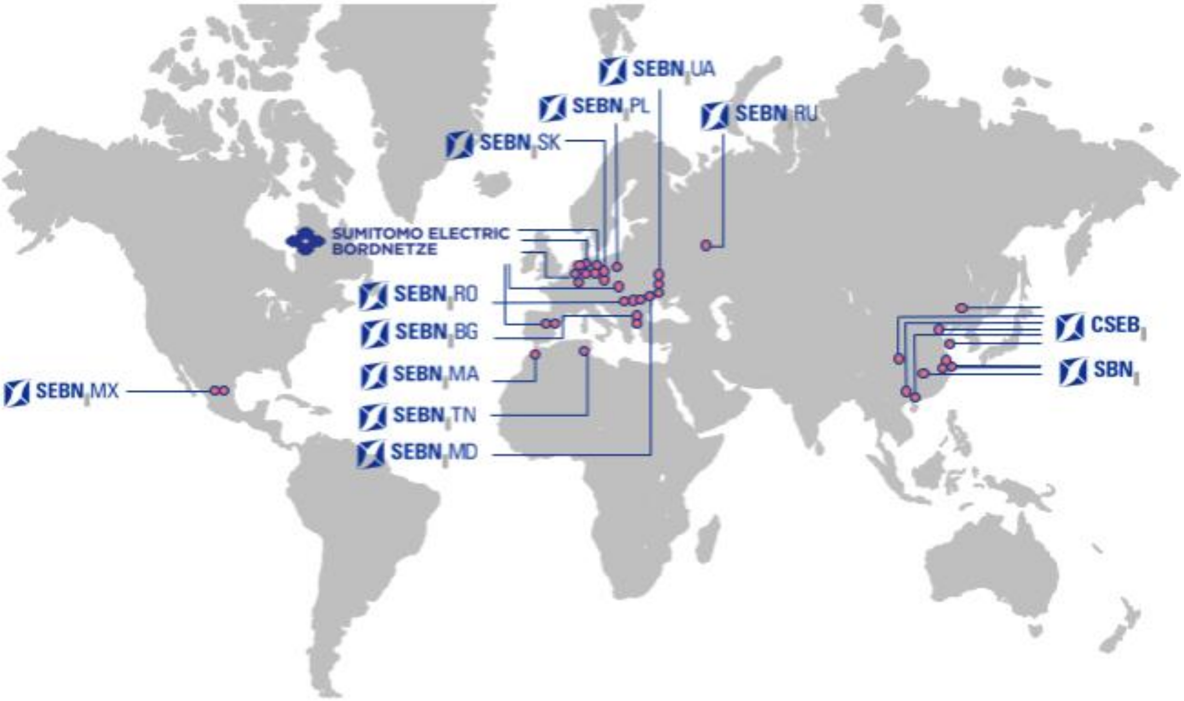


Figure 4: Sumitomo electric bordnetze around the world

3.1 Importants events

- 1986: Volkswagen AG and Bergmann Kabelwerke AG form Volkswagen Bordnetze GmbH with headquarters in Berlin in December. Start of production of the Polo and Golf cable harnesses.

- 1990 : Siemens AG has taken over Bergmann Kabelwerke AG. The share of Volkswagen Bordnetze GmbH held by the company also passed to Siemens AG. Creation of the first foreign site in Cerkezköy / Turkey in November.

- 1992 : Formation of the Polish site in Gorzów.

- 1993 : The business had evolved from one-stop shop to developer and manufacturer. Volkswagen Bordnetze got the development of the Golf A4 and was responsible for design, build, supply chain management, prototypes and design.

- 1995 : First start-up of the logistics center in Emden.

- 1996 : Formation of the Slovak site in Nitra. First start-up of the logistics center in Zwickau.

- 2000 : Relocation of the headquarters from Berlin to Wolfsburg. Creation of AutoSysteme GmbH as a fully-fledged development and sales subsidiary for the purpose of new orders from customers outside Volkswagen.

- 2001 : Formation of the Moroccan site in Tangier. Creation and implementation of the Spanish logistics center in Pamplona.

- 2003 : Creation of the joint venture "Changchun Volkswagen Bordnetze Co., Ltd." in Changchun / P.R. of China with the objective of covering the Chinese market.

- 2004 : The formation of the joint venture "Suzhou Bordnetze Electrical Systems Ltd." near Shanghai.

- 2006 : Volkswagen AG and Siemens AG sell Volkswagen Bordnetze GmbH. Sumitomo Electric Industries and Sumitomo Wiring Systems acquired the company. Formation of the Ukrainian site in Ternopil on June 1st.

The official name change to Sumitomo Electric Bordnetze GmbH was on July 17th. Formation of SE Bordnetze - Bulgaria EOOD in Karnobat on September 14th.

- 2007 : Merger of AutoSysteme GmbH and Sumitomo Electric Bordnetze GmbH on February 15. Creation of the Mexican site "SE Bordnetze - Mexico S.A. de C.V." in Tlaxcala on May 31.

- 2008 : Formation of the Tunisian site "SE Bordnetze - Tunisie S.A.R.L." September 12.

- 2010 : Creation of the Romanian site "SC Automotive Wiring Systems S.R.L." March 15.

4. ORGANIZATION CHART OF SEBN TN

The company hires 4000 employees (executives, supervisors and enforcement agents).

There are three work shifts per day:

- A team from 6:00 a.m. to 2:00 p.m.
- A team from 2:00 p.m. to 10:00 p.m.
- A team from 22:00 to 6:00

Each team changes its schedule from one week to another in parallel with the quality control department.

All these teams are managed and supervised by a production supervisor.

The services mentioned above are represented according to the following organization chart:

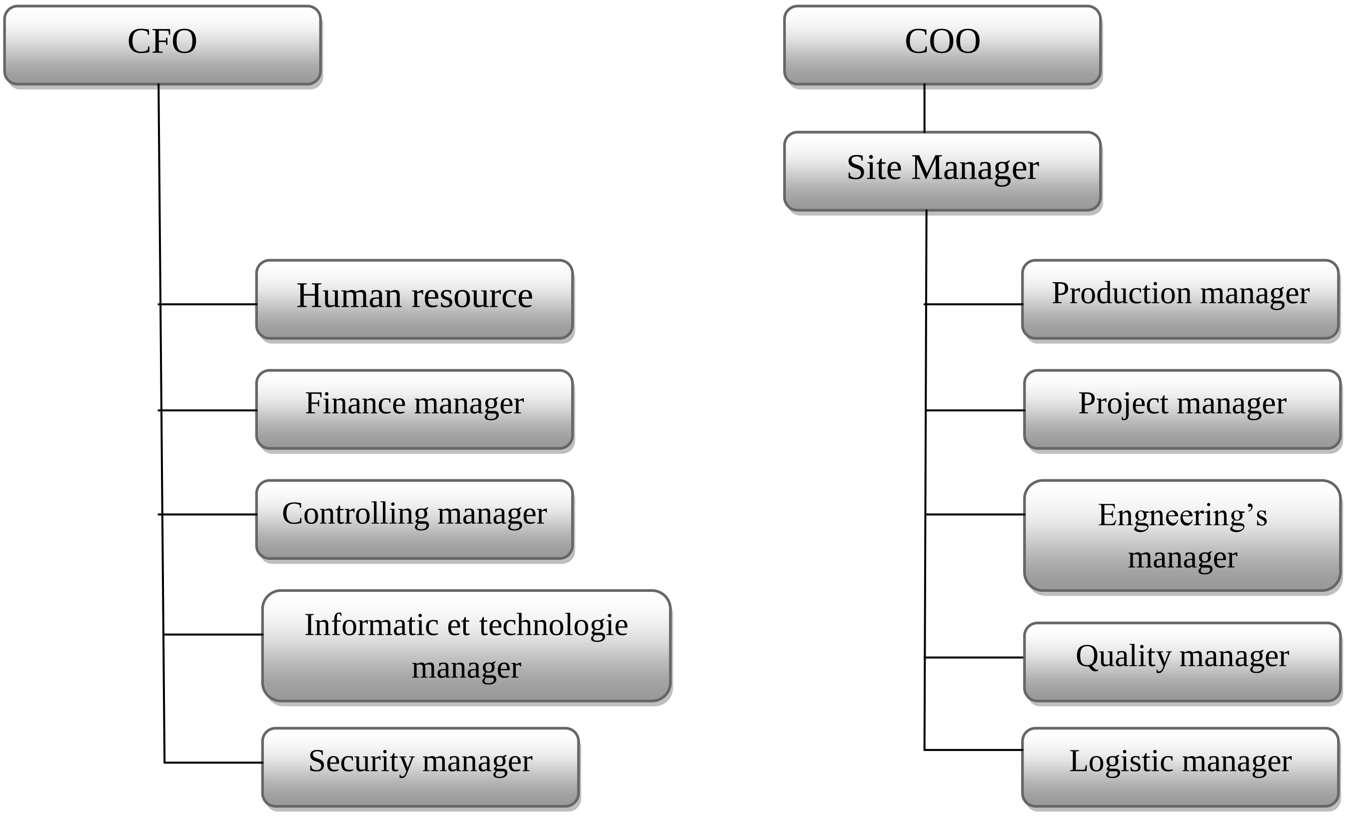


Figure 5: Organisation chart of Sebn Tn

5. PRESENTATION OF DEPARTMENTS WITHIN SEBN TN

The Sebn TN group has its own structure, organization and internal regulations. Sebn TN is organized into seven departments. We can summarize the missions of each department as follows:

5.1 Quality Department (QM)

Qualified as an observer and detector of quality anomalies, ensures continuous improvement of the company within the framework of total quality.

5.2 Administrative and Financial Department (AF)

Enables the financial and accounting functions of the company, to develop and implement financial procedures and management control that affect the financial health of the company.

Making recruitment, training, communication, health and safety actions.

5.3 Computer Department (IT)

This department is responsible for analyzing, designing, implementing, operating and administering the company's computer and technological systems.

5.4 Technical Department (PTS)

This department, made up of: Process, maintenance and facilities, is responsible for ensuring the proper functioning of the machines.

5.5 Production department (PPR)

The main mission of this department is to carry out production programs while ensuring good product quality by respecting the deadlines set beforehand and by optimizing performance to increase production capacity.

5.6 Logistics Department (LOG)

Manages the sourcing, receiving, shipping and storage of raw material and must ensure delivery of the finished product with the minimum possible load.

5.7 Planning Department (PPE)

This work is mainly focused on the technical documentation, the list of components, the operating mode or the working method in the area with the aim of achieving the following objectives:

• Develop production processes

• Analyze and translate customer changes

• Evaluate feasibility and implement customer / internal changes.

• Optimize costs / product development time.

6. PRODUCTS

The SEBN TN plant in Jendouba mainly produces electrical harnesses for the German automotive industry. These bundles are assembled in such a way as to form variants each belonging to a project. The variant is an assembled wiring of a device either inside the vehicle or in the engine compartment. They are delivered to customers as a complete installation and the project will be ready to be installed directly on the vehicle.

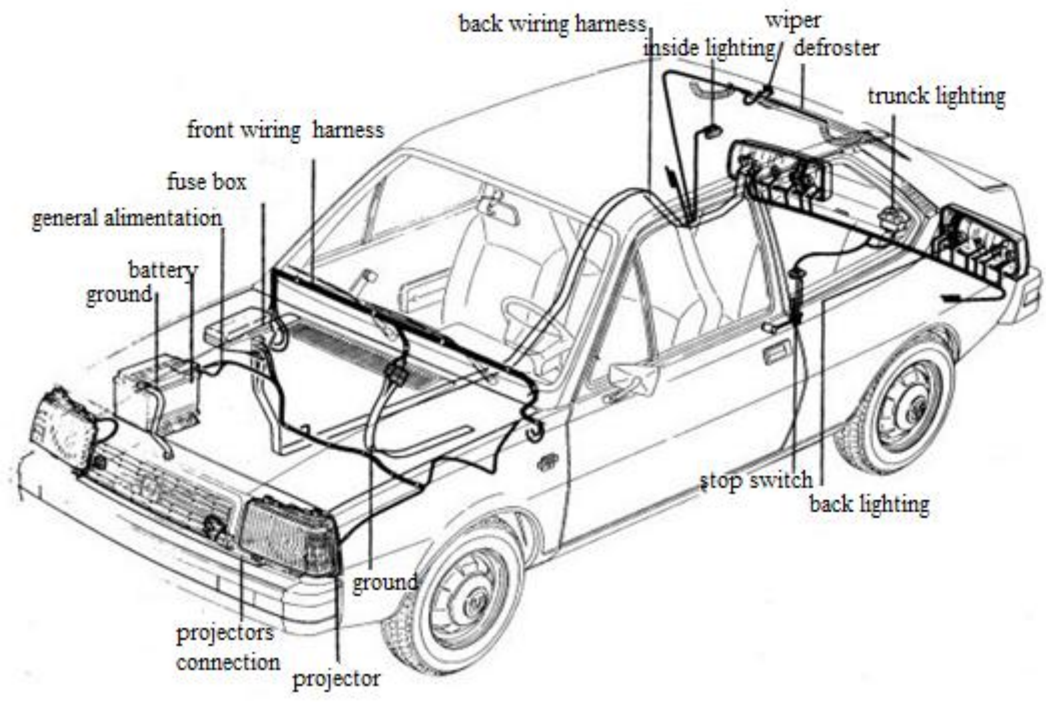


Figure 6: Installation of a car

7. CLIENTS

SEBN TN is the supplier of the leading German automotive industry, Volkswagen. The SEBN-TN company provides a complete wiring installation for vehicles belonging to the Volkswagen group: SEAT, SKODA and Passat B8.

Figure 1:

Volkswagen group logo

Figure 8: SEAT

vehicle logo

Figure 9: SKODA

vehicle logo

CONCLUSION

In this first chapter, I presented the SEBN group as a whole, its organization, its services, the position of its production site within the group and its organization chart. To go into more detail and know the production system of this company, I will discuss the activity in the company in the second chapter.

CHAPTER II

PRODUCTION CYCLE

INTRODUCTION

In this chapter I will move on to the explanation of the production process by properly interpreting the operating principle of the different zones as well as the steps in the preparation of the electrical harnesses. I will present a detailed description of the machines used in the production line of the SEBN-TN.

1. TYPES OF ELECTRICAL WIRING

The main functions of a vehicle's electrical harness are to supply energy to its comfort equipment (window regulators) and certain safety equipment (Airbag, lighting), and also to transmit information to the computers. This product which is the cable consists of a set of electronic conductors, terminals, connectors and protective materials.

A cabling is subdivided into several parts which are linked together. We can therefore distinguish between several types of wiring:

- Main
- Engine
- Body
- Door
- Roof
- Others…

1.1 Electrical components of a cable

A cable is made up of the following elements:

Electric wire: used to conduct electric current with the minimum possible loss, it is made up of copper filaments and insulation. It is defined by: its color, its section, and its species.
Terminal: terminals are accessories that ensure good connectivity with the minimum possible loss.

Protection materials (Fuses): These are parts that protect the cable and all of its parts from current overload which could damage it.

Connector: connectors are parts that contain cavities where terminals are inserted. This operation ensures the connection between the female male terminals to establish a closed electrical circuit. A mechanical locking allows at the end to block this connection.

Clips or staples: These are the elements that secure the cable to the automobile body. Without the assembly of the clips would be impossible, the cable will remain loose causing noise and exposed to deterioration due to friction.

Accessories: By accessory is meant any other component that goes into the manufacture of the finished product. These are components that ensure the protection and insulation of the cable by means of insulation tapes, tubes, plugs, cutlery...

There are also fuses which protect the cable against current faults.

2. MANUFACTURING DIAGRAM

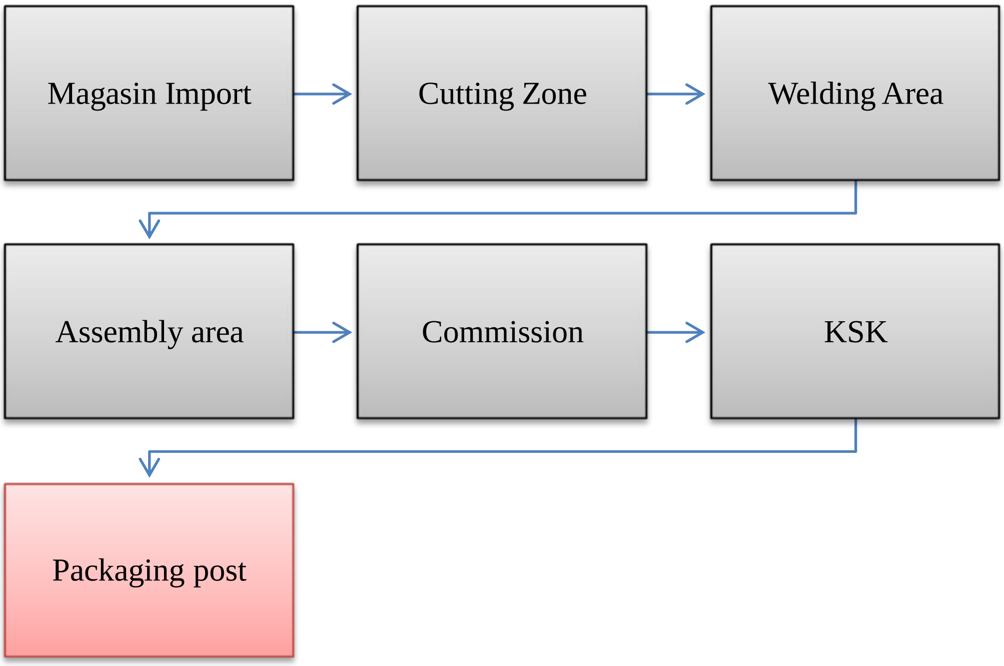


Figure 10 : Manufacturing diagram

3. PRESENTATION OF THE PRODUCTION PROCESS

Production planning is done according to the sales order, the logistics department uses these orders using SAP software to determine the quantities of raw materials required using the MRP method.

The raw material from the supplier goes through the quality control laboratory to undergo an acceptance control before being stored in the raw material store. The stock of raw material is managed by a pull system which prepares a stock for the next 24 hours of production. The daily stock goes to the preparation area (the cut) which is managed by the Kanban system.

SEBN's production process consists of 3 main phases, namely Cutting, Pre-assembly and Assembly.

3.1 Import store

It is a storage space for the raw material (spool of threads, causse, contacts,

The clips, smurf, the bandage or dressing…) which is represented in the following figures.

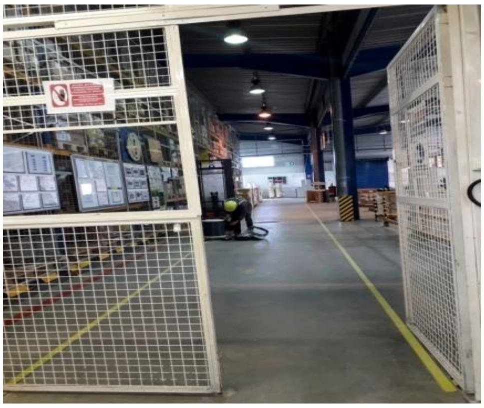


Figure 2: Import store

Figure 3: Spools of thread

3.2 Cutting area

After receiving the raw material, the first step in the production process begins. This is the cut also called the P1 area, it is the first step in the cable manufacturing process. The engineering department determines the color, length and type of wires to be cut by the cutting machines which are controlled by the CAD software.

Figure 13 : Machine Komax alpha 355

➢ Type of product produced by the cutting machine:

Figure 14: Simple cut

Figure15: Stripping of two sides with total extraction

Figure16: Two-sided stripping with partial extraction

3.3 Pre-assembly

After area P1, some of the cut threads pass through the pre-assembly area and undergo other operations, namely:

3.3.1 Automatic crimping

This is the second stage of the assembly area. Crimping is the operation that makes the connection between the end of the electric wire and the contact. This link ensures:

- An electrical function defined by a voltage drop.
- A mechanical function defined by the resistance to tearing.

Figure 17: Machine of crimping

3.3.2 Manual crimping

For terminals which are difficult to crimp automatically, it is necessary to perform this operation using manual presses. The purpose of this operation is to ensure the electrical connection by assembling the cable with the terminal.

Figure 18: Two-sided crimping

Figure 4 : Two-sided crimping with gaskets

3.3.3. Ground welding

Ground soldering involves soldering the ends of multiple wires to a single terminal.

Figure 20: The welding operation

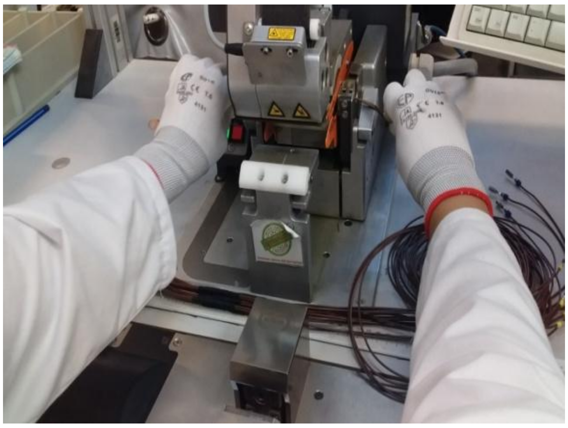


Figure21: Protection of the welded part by an insulator

The machine consists of:

- **Converter:** transforms electrical energy into mechanical energy.
- **Booster:** stabilizes vibrations with the same frequency.
- **Am boss:** this is the central part of Ultrasonic welding
- **Sound rode:** used to fix the wires in the welding position.

3.3.4 Twist

It is a machine that has a function of twisting wires for cabling.

The machine is adjusted by programming the number of revolutions of the drive motors on the counter. This parameter is used to manage the pitch and length of the twisted wires.

Figure22: Twist machine

Figure 23: Exemple of twisting

3.4 Assembly

An assembly line is a set of specialized workstations arranged in the order that corresponds to the succession of cable component assembly operations.

It is usually characterized by the use of a conveyor or a chain of mechanized boards (Jig) or both at the same time. Cables typically go through three main stages during assembly: insertion, wrapping and inspection.

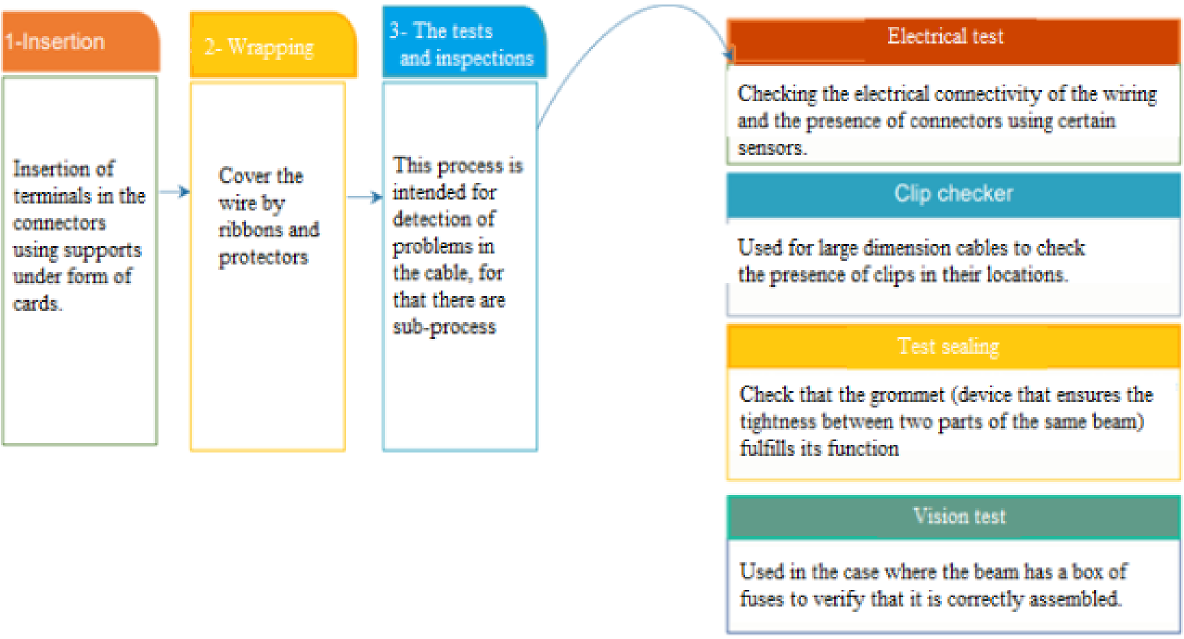


Figure 24: Assembly process

4. ELECTRICAL TEST

The electrical test is a task capable of controlling the various electrical connections between the points constituting the electrical harnesses through electrical control tables (Test bench), it is a control station.

It is used to short-circuit the continuity of the harnesses and the existence of the right wires (color and terminal) in the right positions and the existence of accessories in a simpler way.

Figure 25: Electrical test table

5. OPTICAL TEST

The Optical Test station is an important station to verify the correct existence of fuses and fuses in the fuse box. A camera is dedicated to this test with sensors.

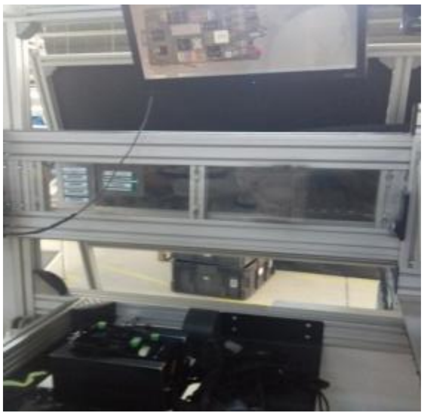


Figure 26: Fuse box being assembled

Figure 27: Electrical test camera

6. PACKAGING POST

After the electrical test and the optical test, the finished wiring is wrapped from the inside and the finished wiring from the engine compartment is wrapped and finally their marriage is done in a single package bearing the reference of the project (vehicle). The finished packed wiring is transported to the export area.

Figure 28: Marriage zone

Figure 29: Export

CONCLUSION

In this chapter I have tried to describe the cable manufacturing cycle. To get a cable, the wire from the import store goes through the cutting shop, pre-assembly, assembly and electrical testing. Finally it will be packed and ready to be transported. In the next chapter, I'll get to the heart of the matter: the case study.

CHAPTER III

SOLUTION WITH AUTOMATIC GUIDED AGV VEHICLES

INTRODUCTION

The cable storage operation carried out in the export area through manual carts guided by workers. The objective of this chapter is to innovate a trendy solution related to Industry 4.0 to improve this method to save time and money. I will try to make a study concerning an installation of automatic guided vehicles AGV.

1. GENERALITIES ON INDUSTRY 4.0

The concept of industry 4.0 or industry of the future corresponds to a new way of organizing the means of production. In the context of industrial automation, this is characterized by the implementation of sensors which are the basic elements of data acquisition and control systems (SCADA). They make it possible to transform physical quantities (temperature, pressure, position, concentration) into signals, most often electrical, which provide information on these quantities. These sensors allow the robots in a production line to interact and adapt the production tool to different needs, but not limited to maintenance, market needs or customer changes.

Industry 4.0 poses the question of the employment of millions of employees around the world. Indeed, the support of current employees and the training of future employees must be taken into account. It seems difficult to imagine that millions of workers will find themselves without a job. More generally, it is necessary to think about the place of humans in this industry.

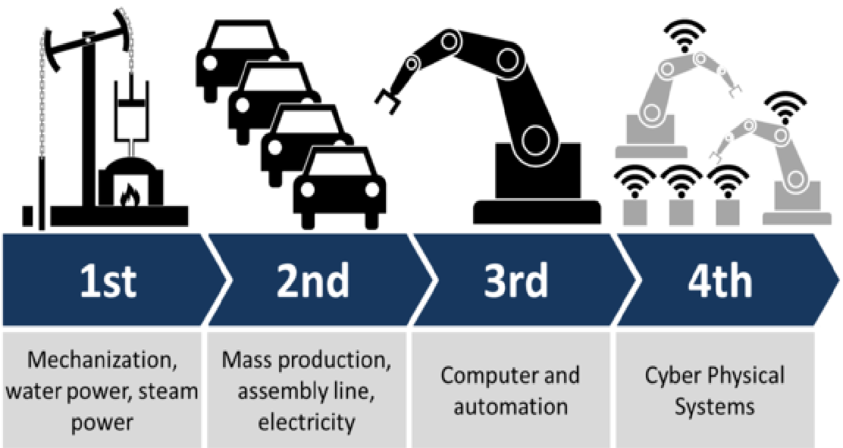


Figure 30: The four industrial revolutions

2. DIFFERENT APPLICATIONS OF ROBOTS

2.1 Exploration of the planets

Like Sojourner, a mission that marked the great return of the Americans to the Red Planet, more than twenty years after the Viking missions. It was also the first time that a mobile robot had walked on a planet other than Earth. It was a total success for NASA, in particular because it validated technological feats that had never been used (until then, such as inflatable cushions, called "airbags", to land on the ground. Mars Pathfinder is also remarkable in view of its cost, very low compared to other robotic space missions.The landing is finally a feat, because two thirds of the ships sent to the planet Mars never reached their final objective.

Figure 31: Sojourner Exploration of the planet Mars

2.2 Military Applications

A military robot, also called an autonomous weapon, is a robot, autonomous or remotely controlled, designed for military applications. Drones are a subclass of military robots.

Systems are already currently in service with a number of armed forces, with remarkable success, such as the "Predator" drone, which is capable of taking surveillance photographs, and even launching air-to-surface missiles.

AGM-114N "Hellfire" II or GBU-12 "Paveway" II in the case of MQ-1 and MQ-9. Studies are continuing because this type of gear offers promising possibilities.

These robots pose ethical and legal problems. This has led associations or NGOs to carry out actions to raise awareness of these problems to supervise the use of these military robots.

Figure 32: Robot for military missions

2.3 Industrial applications

2.3.1 Definition of AGV

An AGV is an automatically guided vehicle. It is equipped with automatic guidance equipment, whether electromagnetic or optical. This type of vehicle is able to follow predefined paths as needed. The Robotics Industries Association defines the robot as a programmable multifunctional manipulator set up to move materials, parts of tools, or specialists through actual movements programmed to accomplish a variety of tasks. Because the AGV is programmable and controlled by a computer, it may seem similar to a robot, but the fact that the AGV must follow a guide path sets it apart from a conventional industrial robot.

2.3.2 AGV guidance

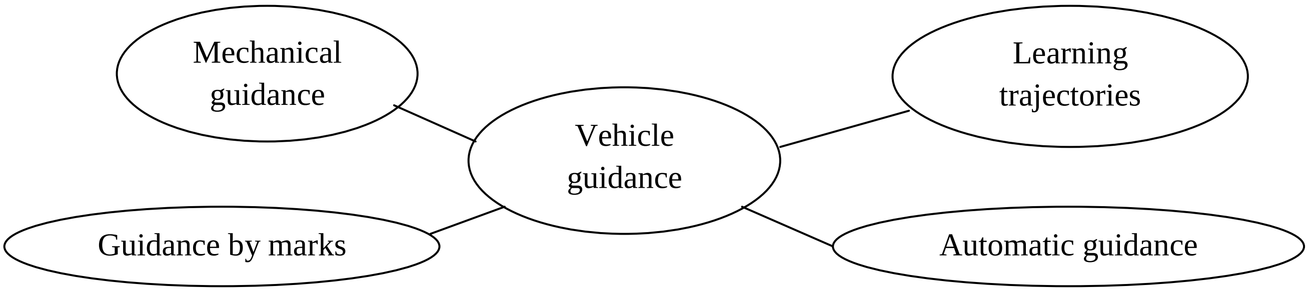


Figure 33: External functional analysis

2.3.3 Industrial applications

AGVs are useful in any industry where there is a need to transport material, in handling and during manufacture. They are also distinguished by the possibility of their uses in situations where humans are not well adapted.

They are used to replace humans in the performance of dangerous tasks. For example, in the nuclear industry where automatic factories use AGVs to transport reprocessed plutonium, a substance of high toxicity.

Until the advent of robotics, these tasks were performed by material handling specialists in elaborate protective suits.

Industrial AGVs perfectly perform tasks that are bothersome and polluting for the individual.

Repetitive tasks, considered boring or exhausting for humans, are an ideal field of application for AGVs.

2.3.4 Interests and advantages of AGVs

The advent of AGVs in industry is no accident. In many material handling situations, they have proven to be the most economical means of transport. Compared to other traditional transport techniques, AGVs have the following advantages:

- Flexibility: Ability to be adaptable to any situation (change of the product to be designed, modification or extension of the manufacturing unit).

- Reduction of costs: Possibility of operating in conditions unfavorable to humans (reduction of energy wasted for lighting and heat, elimination of group work ...).

- High productivity and efficiency: Due in particular to a regular flow transport, without stopping.

- Better stock operations, control and inventory.

- High reliability: The availability of a certain number of AGVs in reserve, ensures the relay for a possible maintenance.

- Less damaged products: Due to the fact that AGVs follow a predefined path, greatly minimizing collisions.

- Conserving energy and the environment: AGVs do not require a lot of energy and operate without polluting the environment (noise, smoke).

- Improved security

2.3.5 Types of AGVs

Depending on the envisaged application and the field of action, we find (figure 34):

- AGV tractors.

- AGV for unit charges.

- AGV pallet tractor.

- AGV fork lift.

- AGV for light load.

- AGV for assembly line.

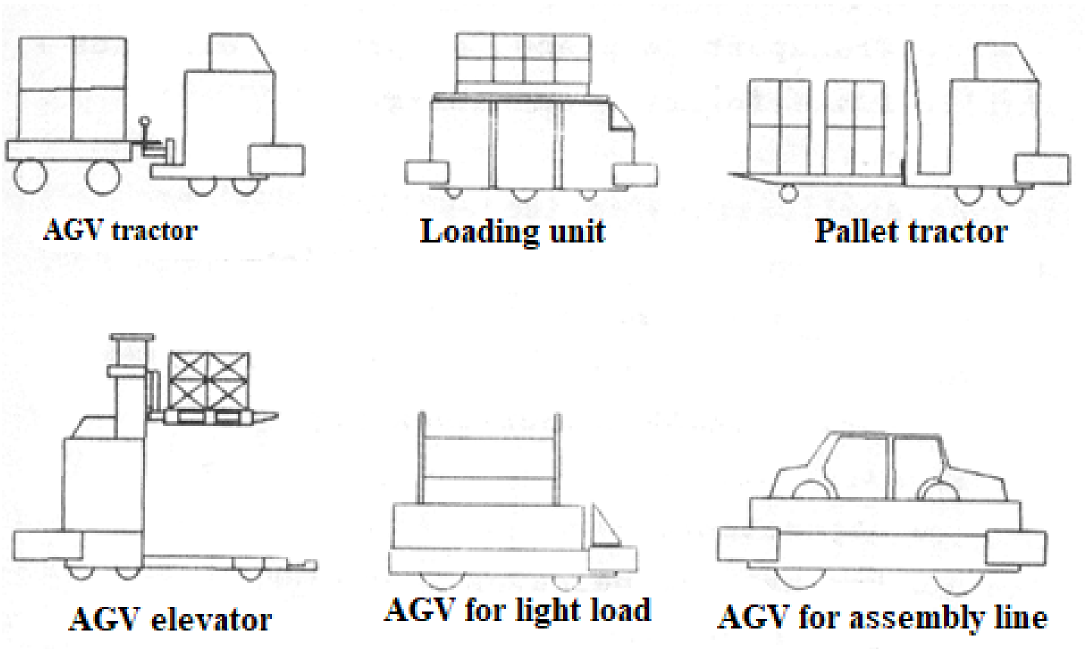


Figure 34: Different types of AGVs

3. EXISTING SITUATION STUDY

At the last stage of production, the workers do the packing of the cables after the marriage operation in export boxes, and then load the boxes into a manual cart, each time the cart is loaded, it will transport its load to the export zone and the trolleys are guided by the workers.

Once the cart reaches this area, the boxes will unload in rows, this operation also being carried out through workers. When the truck arrives for transport, the workers put the boxes in the truck wagon.

Figure 35: Storage operation

3.1 Transport path

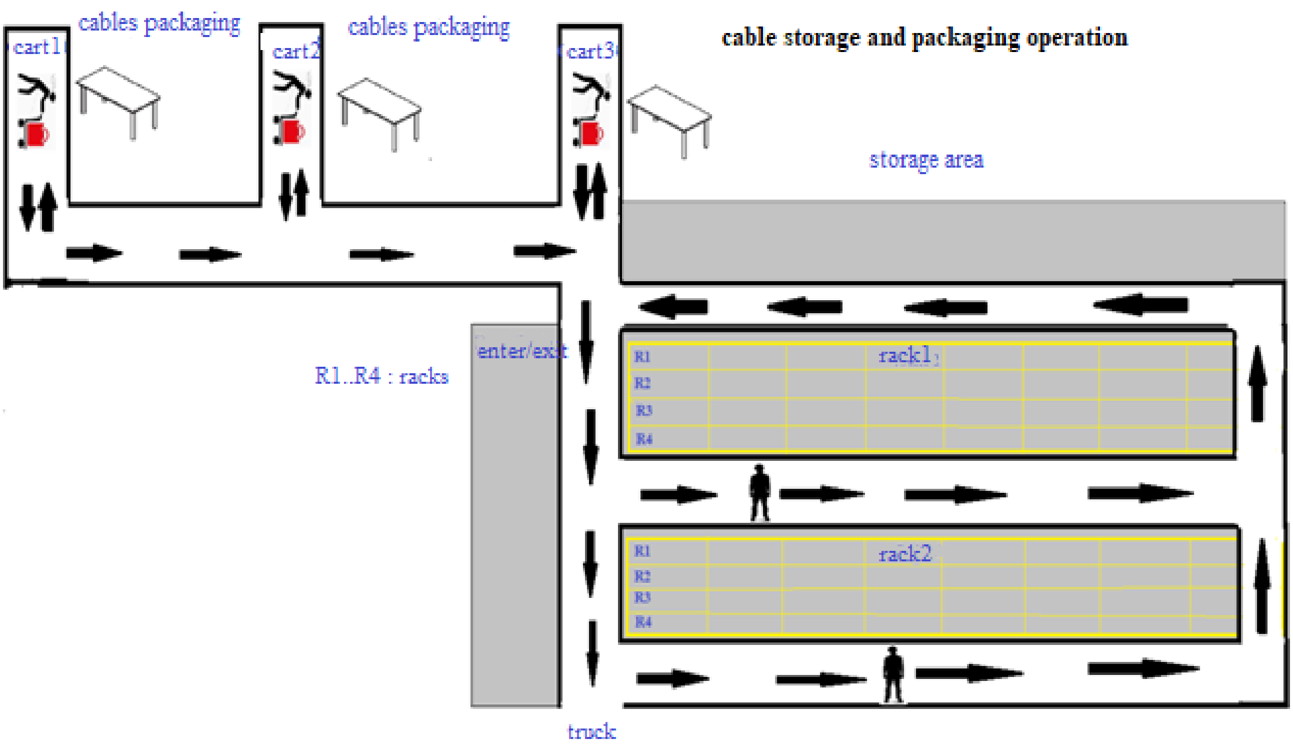


Figure 36: Transport path

3.2 Disadvantages of the existing situation

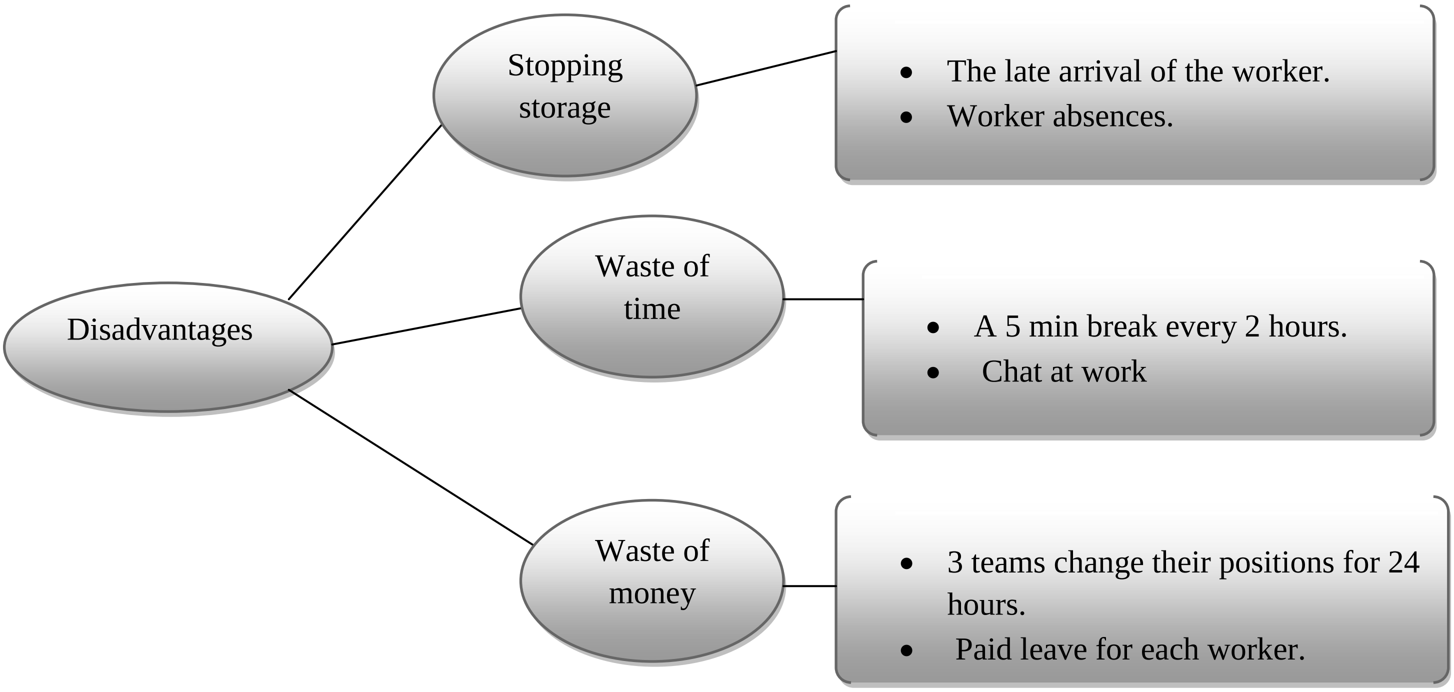


Figure 37: Disadvantges tree

3.3 The PDCA method

To carry out my project well, I will adopt a PDCA approach. This process comprises 4 stages allowing to present the problem, find its causes, choose solutions, implement them, measure the results and finally verify that the actions implemented are effective.

It looks like this:

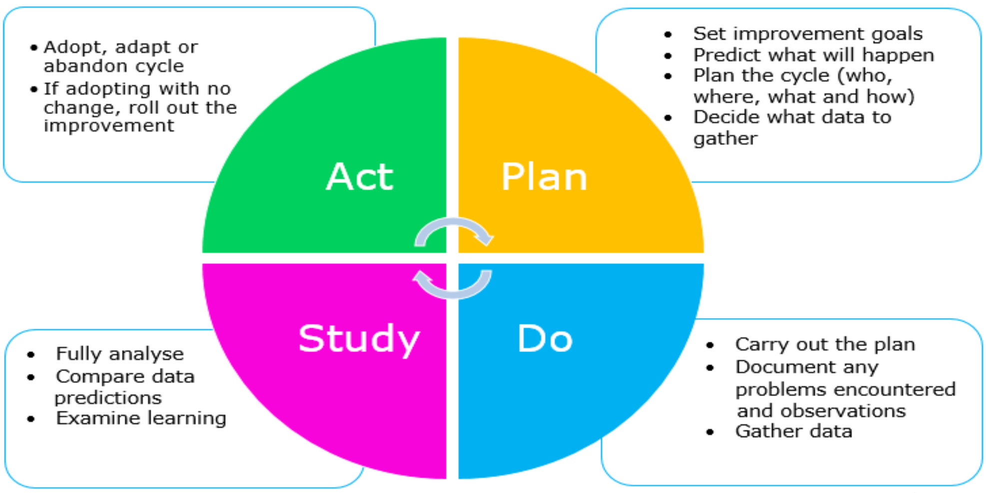


Figure 38: The PDCA approach projected on the project

3.4 5W2H analysis

The 5W2H method makes it possible to have on all the dimensions of the problem, elementary information sufficient to identify its essential aspects. She adopts a constructive critical analysis approach based on systematic questioning.

• What? What is the nature of the problem?

• Who? Who is affected by the problem? Who suffers it?

• Where? Where does the problem appear? On which machine or on which workstation is it detected?

• When? When does the problem start?

• How? 'Or' What? How does the problem happen? What material or procedure are affected?

• Why? Why do we have to solve the problem?

- How much? How much money?

Table 2 : 5W2H analysis

What ?	Waste of time and money in manual storage operation.
Who ?	The Sebn factory in general.
Where ?	Storage area in Sebn.
When ?	It depends on the worker.
How ?	Stopping or delay in the storage operation.
Why ?	Each minute gained we will have more boxes to store. Time costs money.
How much?	Workers' salary payment.

4. STUDY OF THE NEW SOLUTION

4.1 The brainstorming

In the perspective of mastering the storage process, and given the importance of time in any manufacturing plant, I will brainstorm to be able to come out with the most appropriate project idea to solve the problem described before.

The following table shows the overall ideas proposed and retained for the project.

Table 3 : Ideas from brainstorming

symbol	Ideas
A	Replace the current system with a robot (Agv).
B	Automate the current system.
C	Reorganize cable storage.
D	Rearrange the path with the attachment of position sensors.
E	Increase stock capacity.
F	Remote control (with technology).
G	Change the information flow that manages the order.

4.2 External functional analysis

4.2.1 Expression of need

We express the need using the following horned beast diagram:

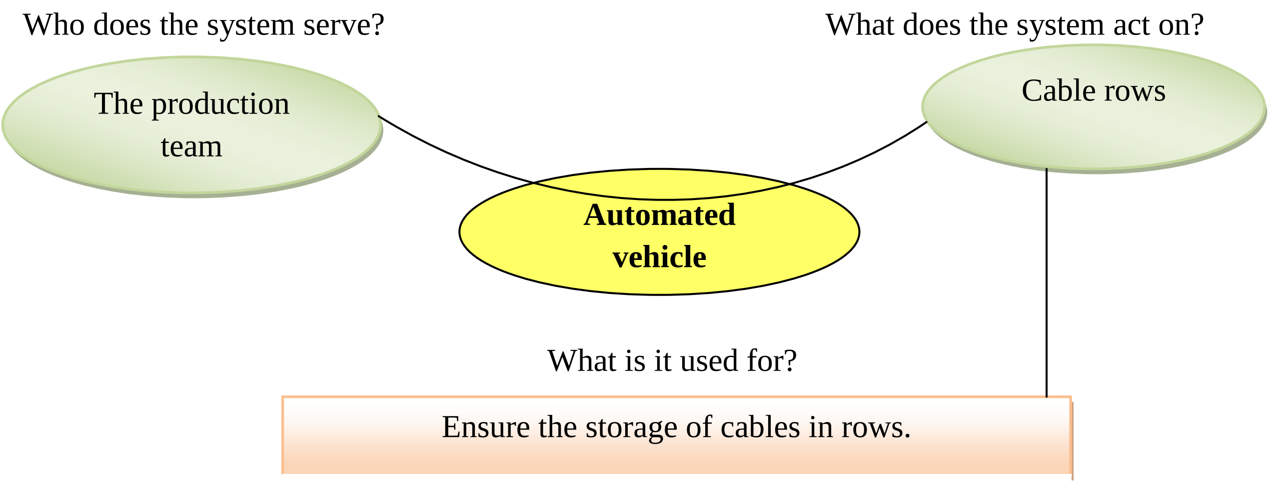


Figure 39: Automated vehicle horned beast

4.2.2 SADT (Global function)

This diagram will present the different links of an automatic system with its environment. It allows you to position:

- Work material input and output flows

- Control data

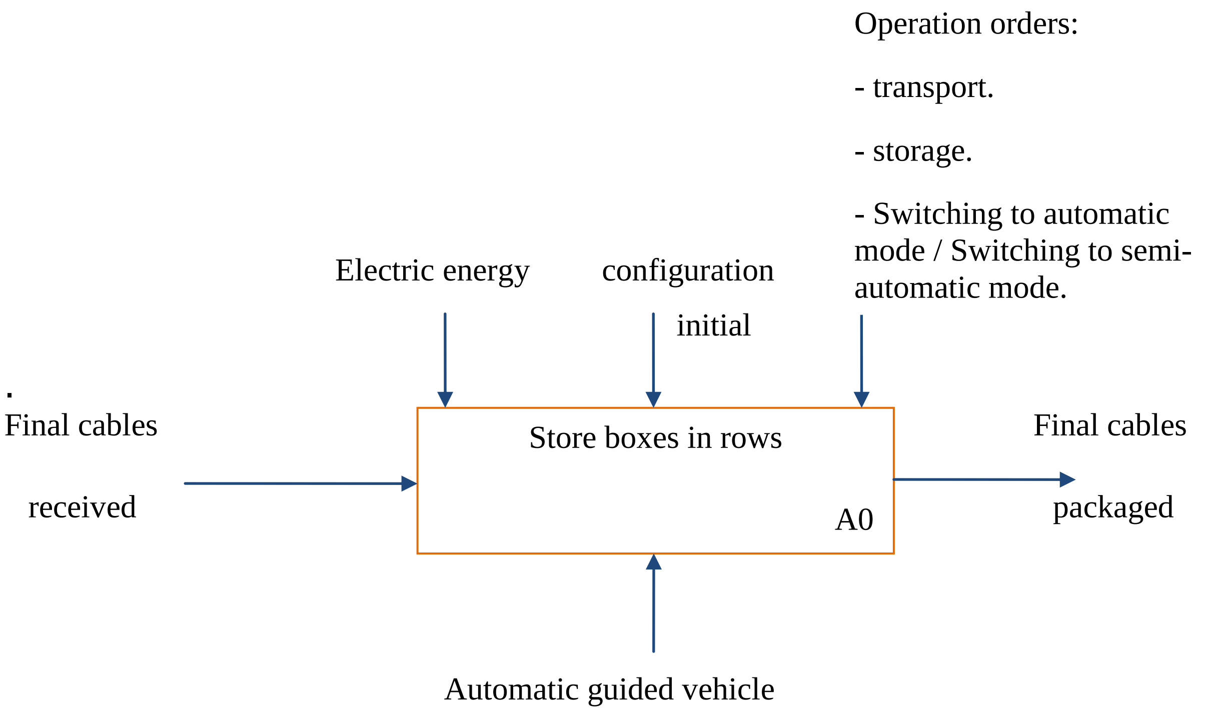


Figure 40: Global function

4.2.3 Creation of the functional tree

As shown below, all functions found are sorted to create the functional tree. The latter is used to synthesize the functions and to identify the links between the functions so as to define the main function of the product as well as its secondary and tertiary functions. When the important functions of the product are identified, it will only be necessary to convert them into functional specifications to obtain the criteria for the selection of concepts.

This step consists of identifying the functions of the product. In order to have a structured global view of the functions, we build the functional tree. This makes it possible to highlight the main sub-systems of the product.

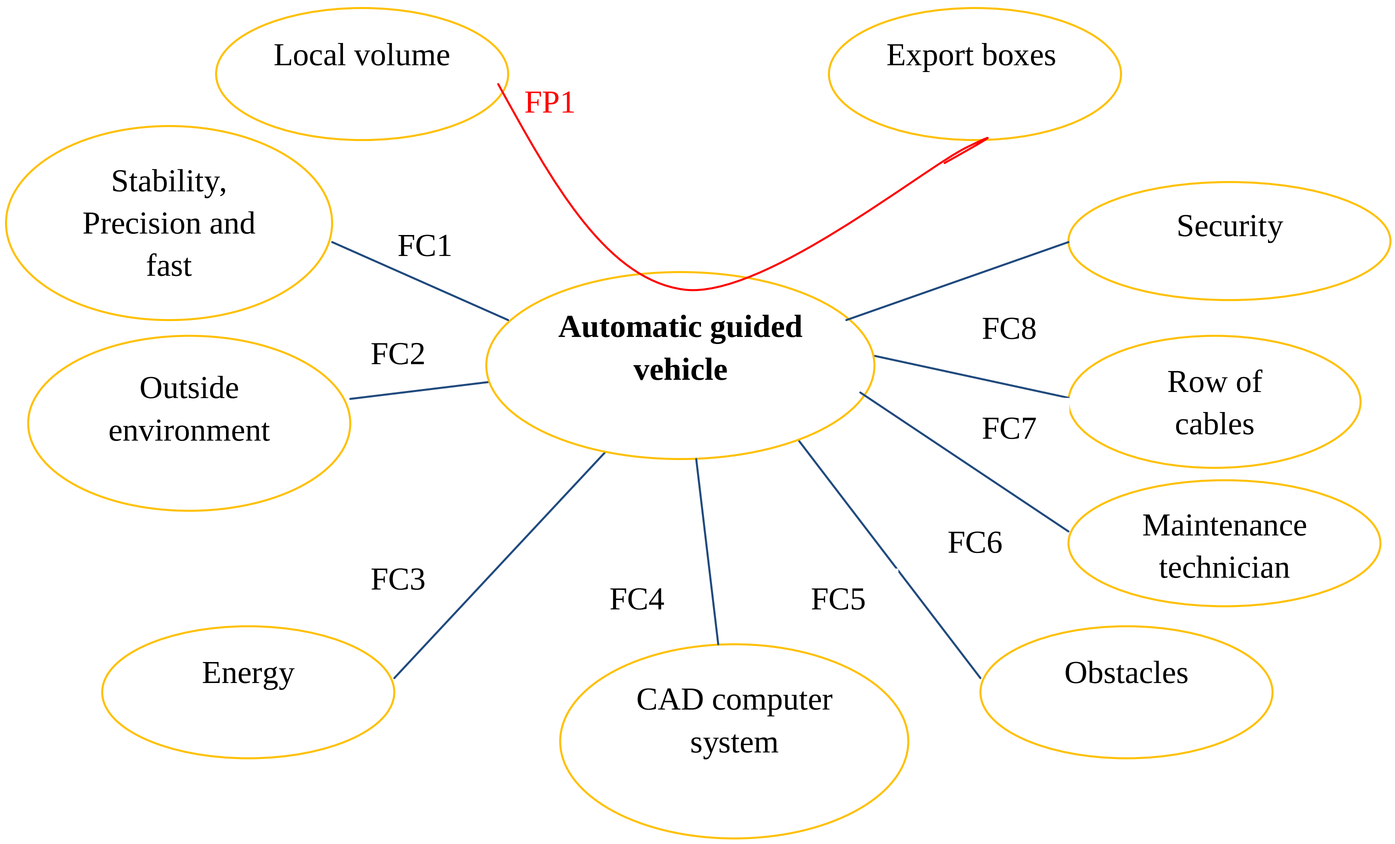


Figure 41: Octopus diagram

From the octopus diagram, we can identify the following functions:

Table 4: The functions identified in the octopus diagram

Functions	Designation
FP1	Receive and transport and store export boxes.
FC1	Be stable, precise and fast.
FC2	Be adapted to the external environment and resistant.
FC3	Being supplied with energy.
FC4	Allow the link with the CAD computer system.
FC5	Cross the course obstacles.
FC6	Be maintainable and easy to intervene.
FC7	Be adapted to the volume of the rows.
FC8	Perform the operation in complete safety.

4.3 System description

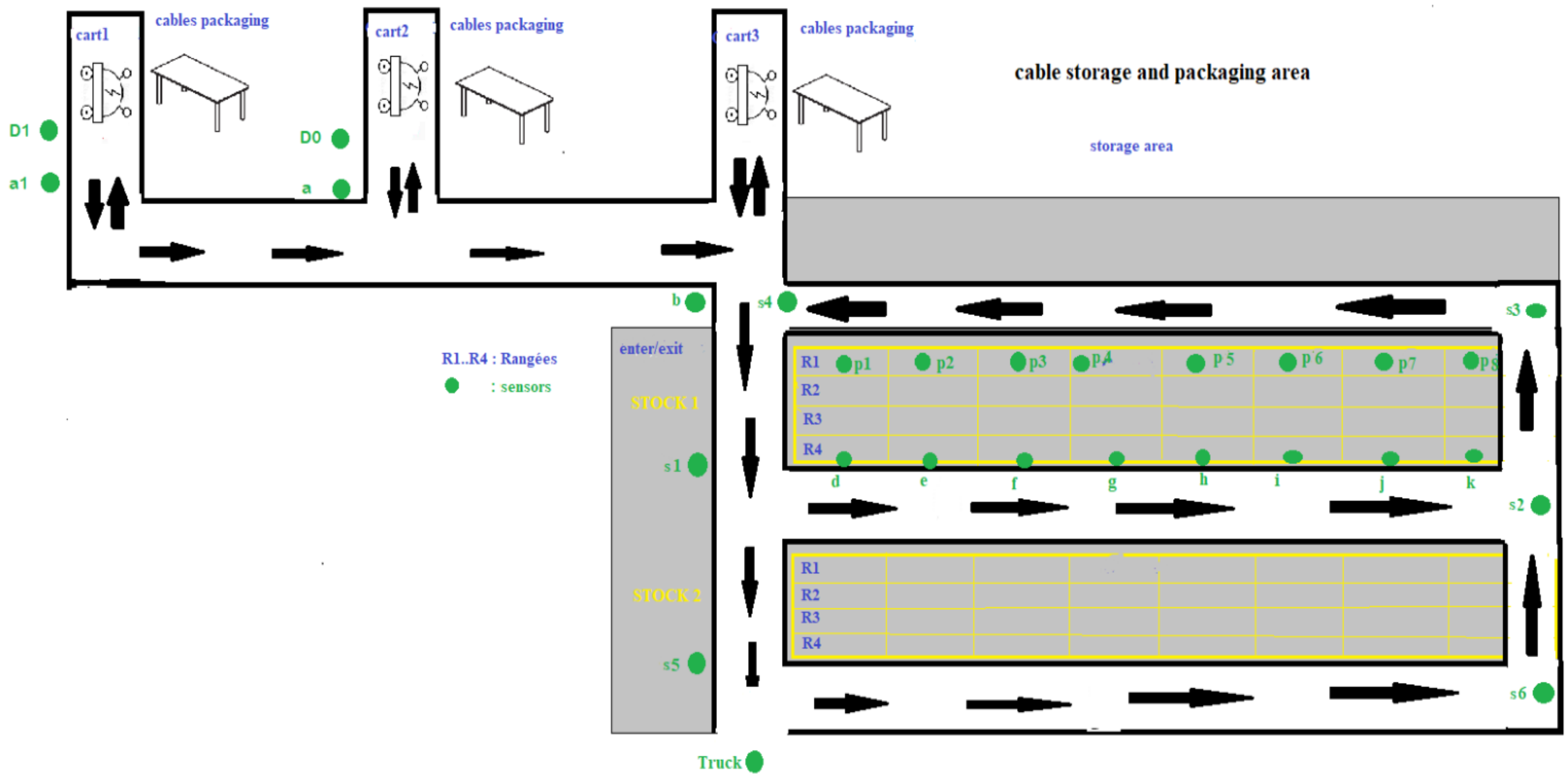


Figure 42: Path description

The system will consist of 3 automatically controlled AGV vehicles.

Each vehicle follows a well-defined circuit to store the cable export boxes in a storage area (final production step).

The 3 vehicles will follow 3 different paths: each agv will fill a line (STOCK).

The presence of the sensor (Truck) indicates the arrival of the truck to transport the final product.

4.3.1 Agv 1 path

The worker presses a start button (m) once for the Agv 1 to start with the presence of the D0 sensor and the LM antenna.

After loading the boxes in the vehicle (Agv 1), the sensor (Ch1) is activated, the motor runs in the forward direction and the Agv 1 begins to move until it reaches the sensor (a), once (a) is activated the robot makes a 90 ° turn to the left with a low speed then it resumes its path towards the sensor (b).

If (b) is activated, Agv 1 makes a right turn at the same angle and at low speed then continues with its nominal speed until (s1), when this sensor is activated, Agv 1 makes another turn to the left and he goes into the area where the STOCK 1 locker is located up to (d).

Once the sensor (d) is activated, the Agv 1 automatically stores the boxes in the row. The discharge operation is carried out as follows:

The output of two arms using 3 hydraulic pistons cylinder , V3 (vertical for R1, R2, R3) then V1 and V2 (horizontal), the activation of the sensor (Pi) indicates that the carrier is correctly positioned in the locker, it ensures the discharge then gives the order to retreat the pistons simultaneously (P sensor initial state). For row R4 on the ground there is no need for a vertical V3 piston cylinder. When this operation is complete, the Agv 1 returns:

s2: Left ➔ s3: Left s4: Right ➔ ➔ b: Left ➔ a: Right ➔ D0: Stop

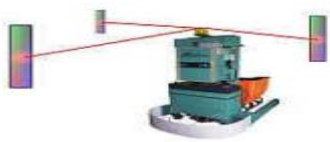


Figure 43: Detection of sensors

The cycle of agv 1 repeats itself in order to fill all the lockers; it will fill the lockers in an orderly manner:

(e) Activated ⟶ storage (P2)

(f) Activated ⟶ storage (P3)

(g) Activated ⟶ storage (P4)

(h) Activated ⟶ storage (P5)

(i) Activated ⟶ storage (P6)

(j) Activated ⟶ storage (P7)

(k)Activated ⟶ storage (P8)

Figure 44: Storage operation

4.3.2 Agv 2 path

The worker presses a start button (m) once for the Agv 2 to start with the presence of sensor D1 and the LM and Ch2 antenna.

Same operating principle in order to fill STOCK 2, the circuit is as follows:

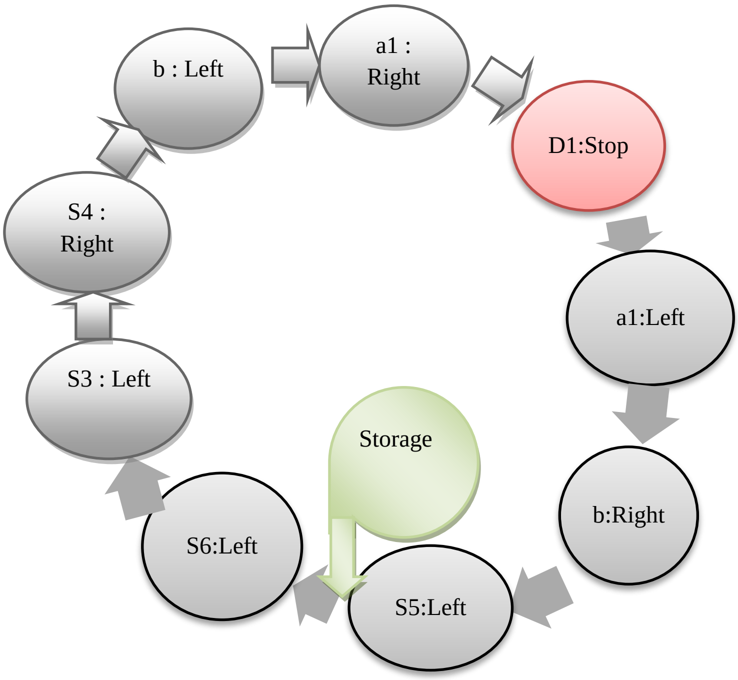


Figure 45: Agv 2 vehicle path

Also Same operating principle of the agv 3 in order to fill STOCK 3.

If the sensor (Truck) is activated, the Agvs begins the operation of transporting boxes located at the level of the storage area (STOCK 1, 2, 3) to the truck wagon.

Figure 46: 3D view of SEBN TN with transport trucks

4.3.3 Paths safety study

The aim of this study is to avoid accidents between AGVs and other possible obstacles during the transport operation (people, objects, etc.).

Safety will be ensured by the lazer safety laser scanner S300 Professional sensor. The safety laser scanner is an optical sensor that scans its surroundings in two dimensions using infrared laser beams. It is used to monitor hazardous areas on machines or vehicles.

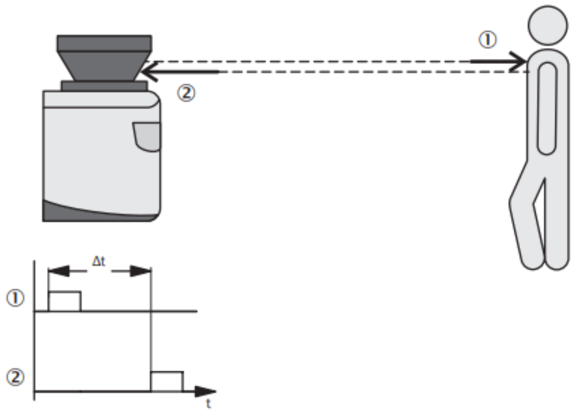


Figure 47: Working principle of safety laser scanner light time-of-flight measurement

1 Light pulse emitted

2 Reflected light pulse

The device works on the principle of measuring the time of flight of light. The device emits very short light pulses (emitted light pulse). An "electronic stopwatch" is started simultaneously. When light hits an object, the object reflects it and the safety laser scanner receives the light (received light pulse). The device calculates the distance to which the object is from the time elapsed between the moment of emission and that of reception (Δt).

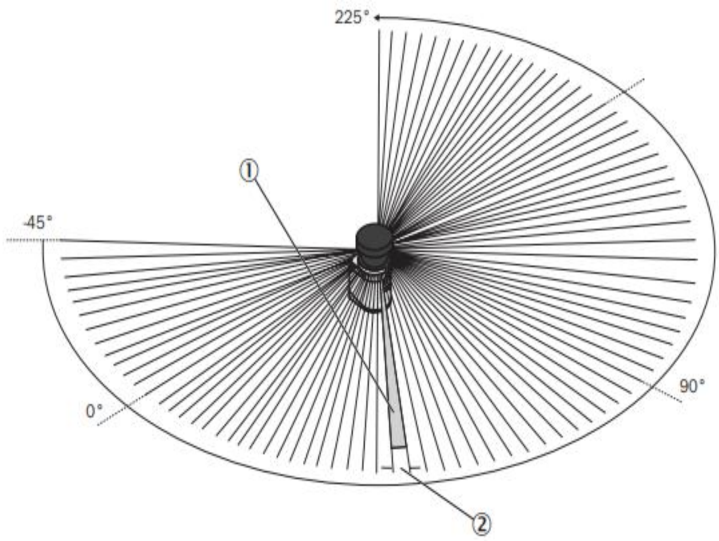


Figure 48: Operating principle by rotating the safety laser scanner

1 Angular resolution

2 Object resolution

The device is also provided with a rotating mirror which deflects the light pulses so that they sweep a circular sector of 270 °. This makes it possible to identify an object within the 270 ° protective field. The first beam of a scan starts at -45 °, relative to the rear of the safety laser scanner. The device emits its light pulses with an angular resolution of 0.5 ° 1. Resolutions between 30 mm and 150 mm can thus be achieved 2.

Communication is ensured by an EFI link. In an EFI connection with an S3000, the S300 must be configured as a slave. It should not be configured as a master.

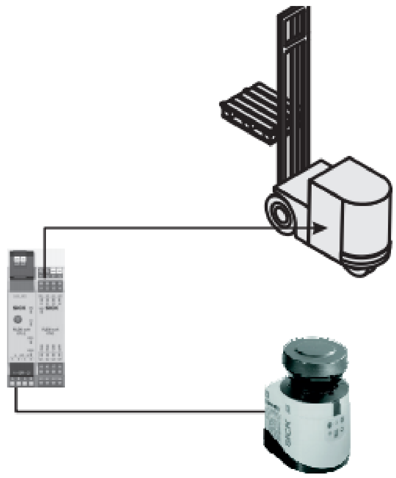


Figure 49: EFI connection with Flexi Soft

4.4 General design

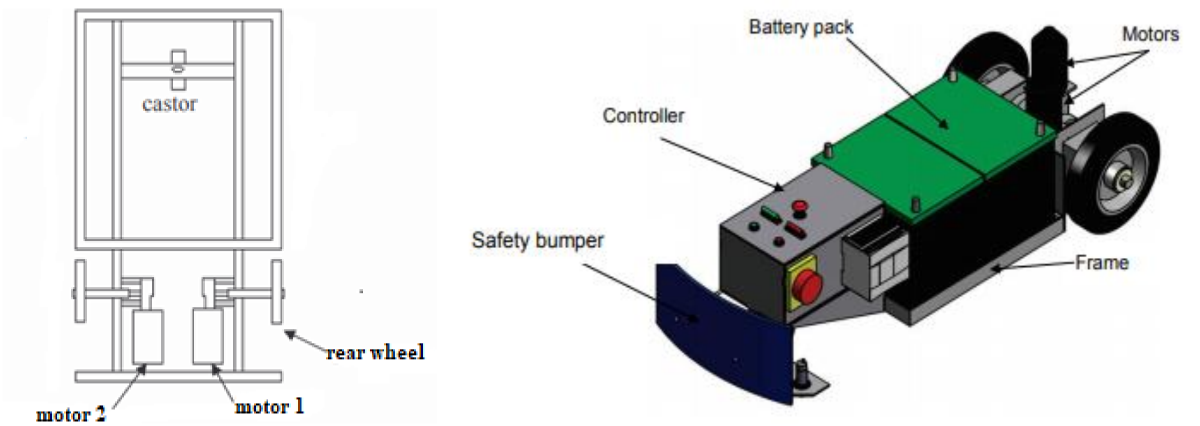


Figure 50: Estimate for the base of the AGV

4.4.1 Guiding principle

The movement of the vehicle depends on the speeds of the two driving wheels at

The rear:

• When driving the vehicle forward, the two motors will run at the same speed and in the same direction.

• For reverse gear, both motors will run at the same speed but in reverse.

• To turn slowly right, stop the right engine and leave the left engine running; and to turn right quickly, turn the right motor in the opposite direction, and leave the left motor running.

• To turn left slowly, stop the left engine and leave the right engine running; and to turn left quickly, turn the left motor in the opposite direction, and leave the right motor running.

• To stop the vehicle, stop both engines.

4.5 Control system

4.5.1 PLC control

A PLC, acronym for Programmable Logic Controller or Programmable Logic Controller or Industrial Programmable Logic Controller (API), is a computer used in industry that automates electromechanical processes.

Unlike computer computers, PLCs are prepared for multiple input and output signals, both digital and analog, for greater temperature ranges, immunity to electrical noise and resistance to vibration, in short, to function properly in industrial environments.

4.5.2 Functions performed by a PLC

Detection: Reading of sensor signals (digital input).

Command: Develop and send actions to the elements, using actuators and pre-actuators (outputs).

Programming: Allows you to enter, expand and change the PLC application program. It allows to modify the program even when the PLC is controlling the process or the machine.

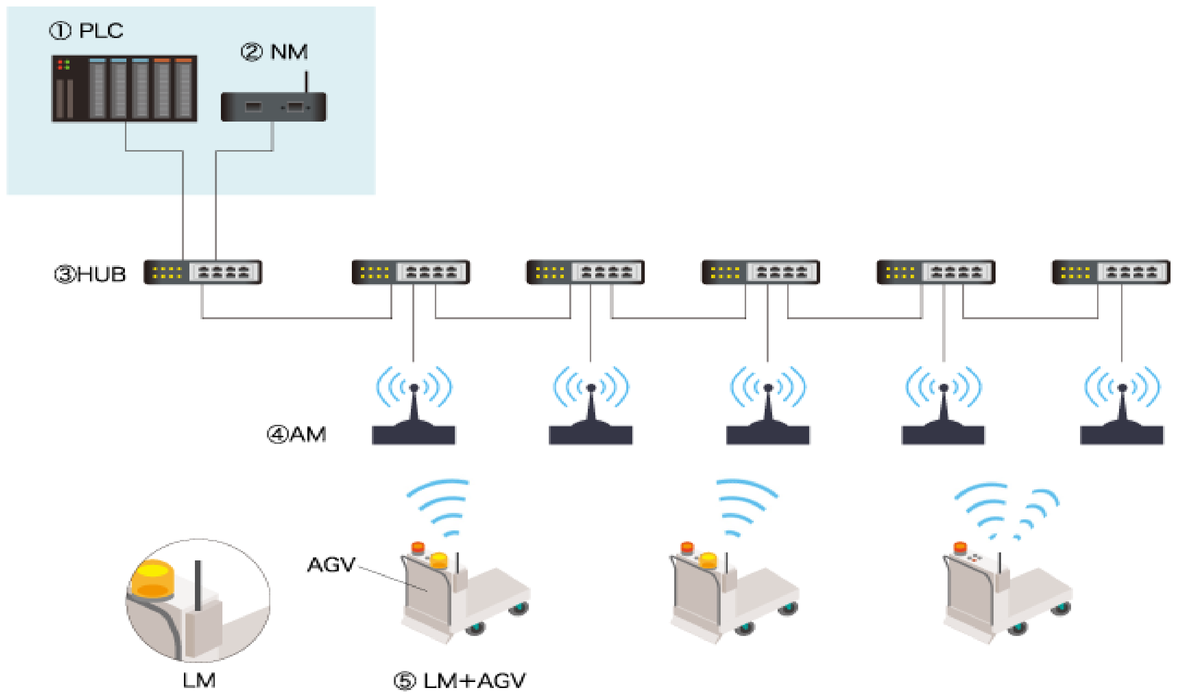
Communication networks: Used to establish communication with other control parties. Industrial networks allow communication and data exchange between PLCs, SCADA, DCS, OPC and computer applications in real time.

Supervision systems: PLCs allow communication with computers equipped with industrial supervision program (SCADA) and provide field data. This communication takes place through an industrial network.

Distributed Inputs-Outputs: The input and output modules do not necessarily have to be near the PLC CPU. It is possible to distribute them in the installation; they communicate with the central by means of a network which, with new technologies, can be wired but also wireless.

Remote Control, is software for remote access and remote assistance on industrial PCs and operator panels, based on Windows operating systems and its serial ethernet and sub-series networks.

4.5.3 General information on the control system



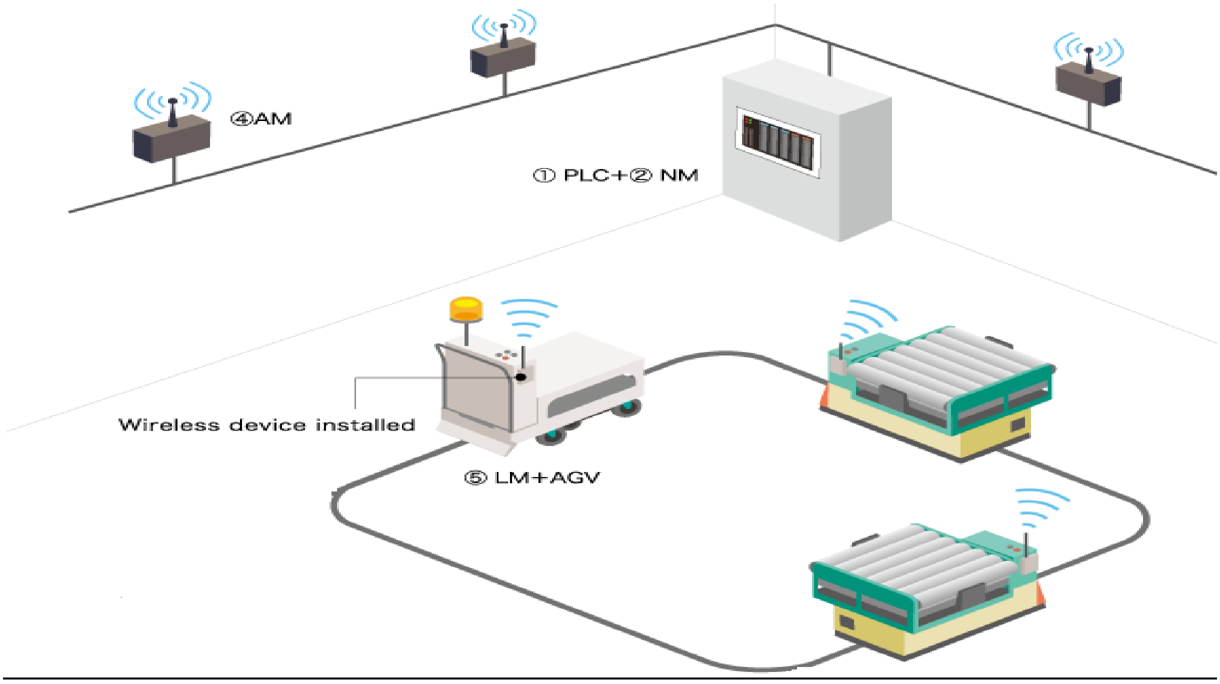


Figure 51: Control system

(1) API for integrated control of AGV: This API is for integrated control of AGV

(2) NM (Network master): this device reads and writes the data sent and received between the PLC and the AGV

(3) HUB

(4) AM (Area Master): wireless relay machine. This machine communicates wirelessly with LM.

(5) LM (Local Master): cordless cordless handset. AGV equips each machine with 1 unit.

4.5.4 Grafcet

Grafcet (Functional Steps and Transitions Control Graph) is a method of representing and analyzing an automation, particularly well suited to systems with sequential evolution, that is to say broken down into steps.

The following representation concerning the first run of agv1 and 2 (first row filling).

➢ Grafcet control part point of view (See appendix 1)

For this last level of representation, the technological choices concerning the preactuators and the sensors are made. This grafcet describes the chronology of the signals sent and received by the PC.

Symbols	Variables	Comments
a	I2	position sensor
b	I3	position sensor
D0	I6	position sensor
g	O2	position sensor
m	I1	start up
REMD	O1	Right Motor Electric Relay
p	I8	position sensor
p1	I9	position sensor
s1	I4	position sensor
s2	I5	position sensor
s3	I6	position sensor
s4	I7	position sensor
REY1E	O6	Electric relay of the cylinder distributor coil V1
REY1S	O4	Electric relay of the cylinder distributor coil V1
REY2E	O7	V2 actuator distributor coil electrical relay
REY2S	O5	V2 actuator distributor coil electrical relay
D1	I10	position sensor
a1	I11	position sensor
s5	I12	position sensor
s6	I13	position sensor
Lm	I14	antenna
REMG	O8	Left engine electric relay
ch1	I15	weight sensor
ch2	I16	weight sensor
d	I17	position sensor

Figure 52 : Sensor addresses

➢ <u>Simulation with AUTOMGEN A8</u>

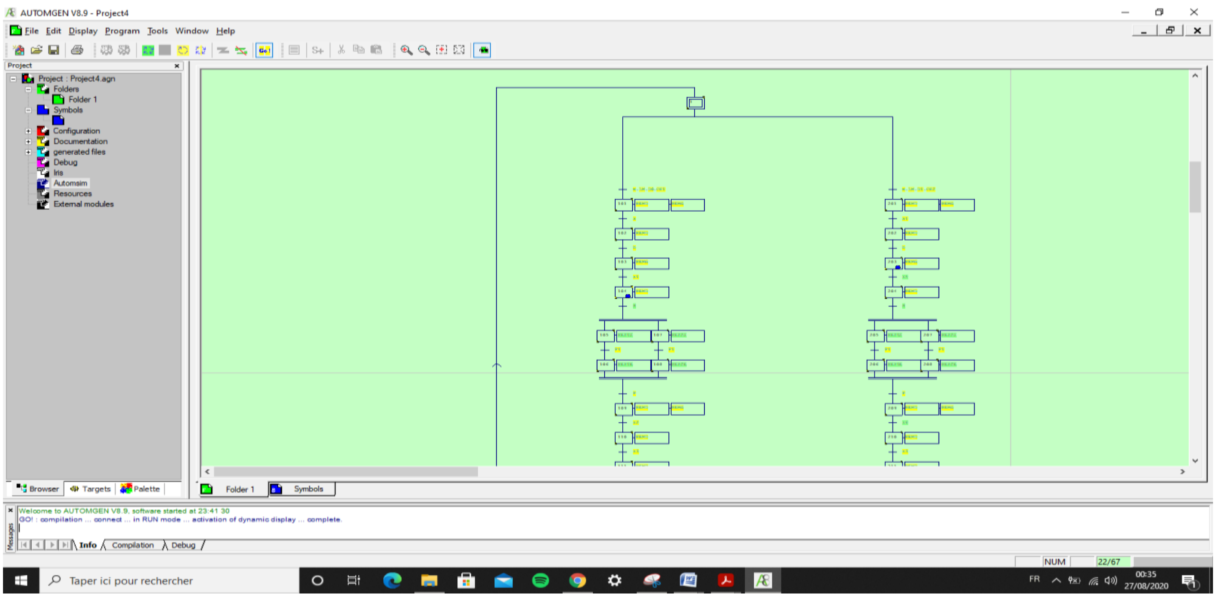


Figure 53 : Automgen simulation A8

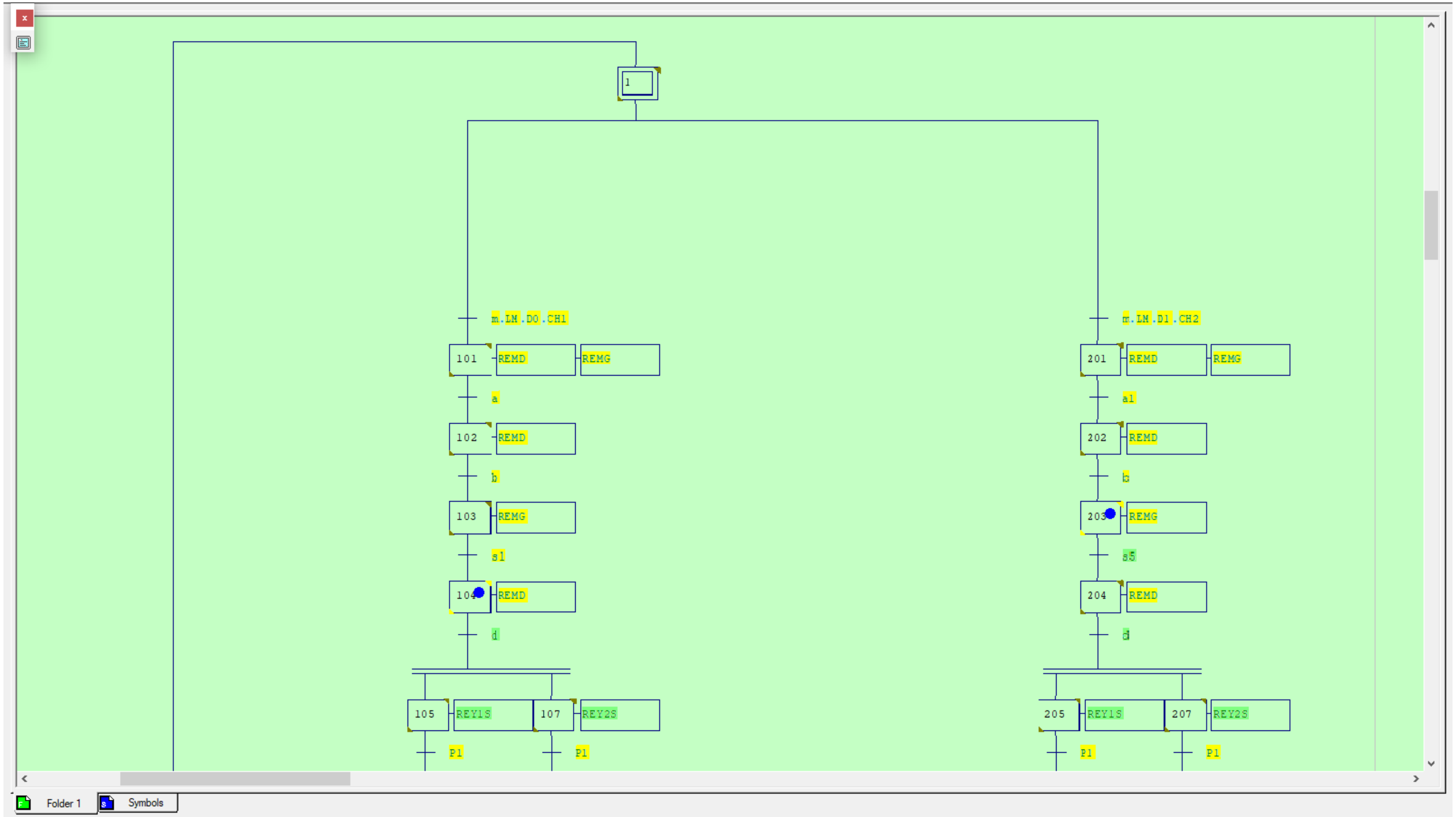


Figure 54 : Grafcet

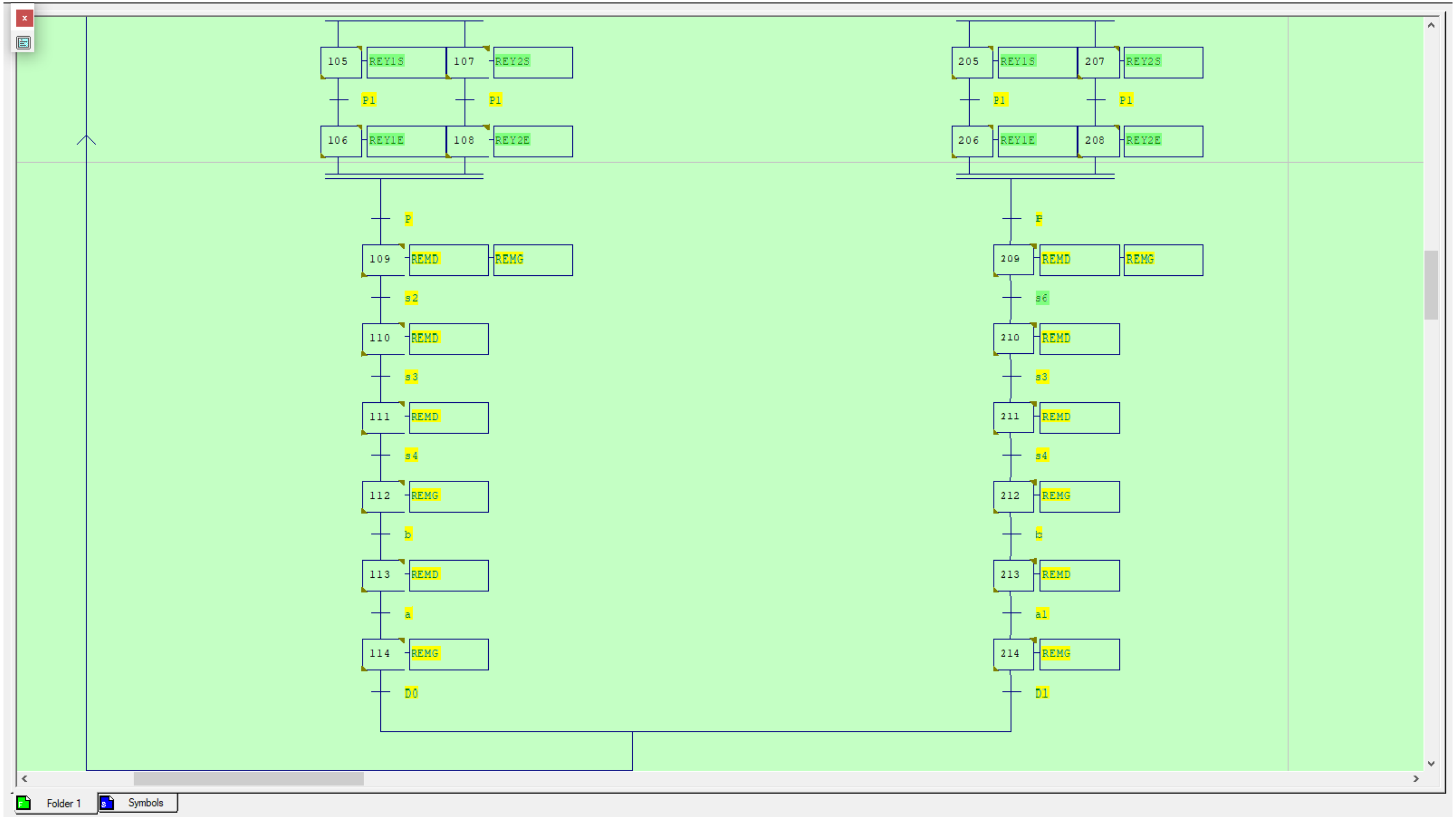


Figure 55 : Grafcet

- <u>The equations of the stages</u>

Table 5: LD equations

AGV1	AGV2
$X101= (X1.\ m.LM.D0.CH1+X101).\ \overline{X102}$	$X201= (X1.\ m.LM.D1.CH2+X201).\ \overline{X202}$
$X102= (X101.a+X102).\ \overline{X103}$	$X202= (X201.a1+X202).\ \overline{X203}$
$X103= (X102.b+X103).\ \overline{X104}$	$X203= (X202.b+X203).\ \overline{X204}$
$X104= (X103.s1+X104).\ (\overline{X105}+\overline{X107})$	$X204= (X203.s5+X204).\ (\overline{X205}+\overline{X207})$
$X105= (X104.d+X105).\ \overline{X106}$	$X205= (X204.d+X205).\ \overline{X206}$
$X106= (X105.P1+X106).\ \overline{X109}$	$X206= (X205.P1+X206).\ \overline{X209}$
$X109= (X106.X108.P+X109).\ \overline{X110}$	$X209= (X206.X208.P+X209).\ \overline{X210}$
$X110= (X109.s2+X110).\ \overline{X111}$	$X210= (X209.s6+X210).\ \overline{X211}$
$X111= (X110.s3+X111).\ \overline{X112}$	$X211= (X210.s3+X211).\ \overline{X212}$
$X112= (X111.s4+X112).\ \overline{X113}$	$X212= (X211.s4+X212).\ \overline{X213}$
$X113= (X112.b+X113).\ \overline{X114}$	$X213= (X212.b+X213).\ \overline{X214}$
$X114= (X113.a+X114).\ \overline{X1}$	$X214= (X213.a1+X214).\ \overline{X1}$
$X107= (X104.d+X107).\ \overline{X108}$	$X207= (X204.d+X207).\ \overline{X208}$
$X108= (X107.P1+X108).\ \overline{X109}$	$X208= (X207.P1+X208).\ \overline{X209}$
$X1= (X114.D0+X214.D1+X1).\ (\overline{X101}.\overline{X201})$	
REMD=X101+X102+X104+X109+X110+X111+X113	REMD=X201+X202+X204+X209+X210+X211+X213
REMG=X101+X103+X109+X112+X114	REMG=X201+X203+X209+X212+X214
REY1S=X105	REY1S=X205
REY1E=X106	REY1E=X206
REY2S=X107	REY2S=X207
REY2E=X108	REY2E=X208

- <u>Adressing</u>

Stages:

Table 6 : Addresses of steps

X101=%M0.0	X108=%M0.7	X201=%M1.7	X208=%M2.7
X102=%M0.1	X109=%M1.1	X202=%M2.1	X209=%M3.1
X103=%M0.2	X110=%M1.2	X203=%M2.2	X210=%M3.2
X104=%M0.3	X111=%M1.3	X204=%M2.3	X211=%M3.3
X105=%M0.4	X112=%M1.4	X205=%M2.4	X212=%M3.4
X106=%M0.5	X113=%M1.5	X206=%M2.5	X213=%M3.5
X107=%M0.6	X114=%M1.6	X207=%M2.6	X214=%M3.6
X1=%M3.7			

Inputs:

Table 7 : Addresses of inputs

a=%I0.0	s2=%I0.5	s6=%I1.3	d=%I1.7
b=%I0.1	s3=%I0.6	LM=%I1.4	D0=%I2.1
m=%I0.2	s4=%I0.7	ch1=%I1.5	D1=%I2.2
s1=%I0.3	s5=%I1.1	ch2=%I1.6	a1=%I2.3
P=%I0.4	P1=%I1.2		

Outputs:

Table 8 : Addresses of outputs

REY1E=%Q0.0	REY2S=%Q0.3
REY1S=%Q0.1	REMD=%Q0.4
REY2E=%Q0.2	REMG=%Q0.5

- <u>Language LADDER (LD)</u>

Simulation of a few system steps: (see Appendix 2)

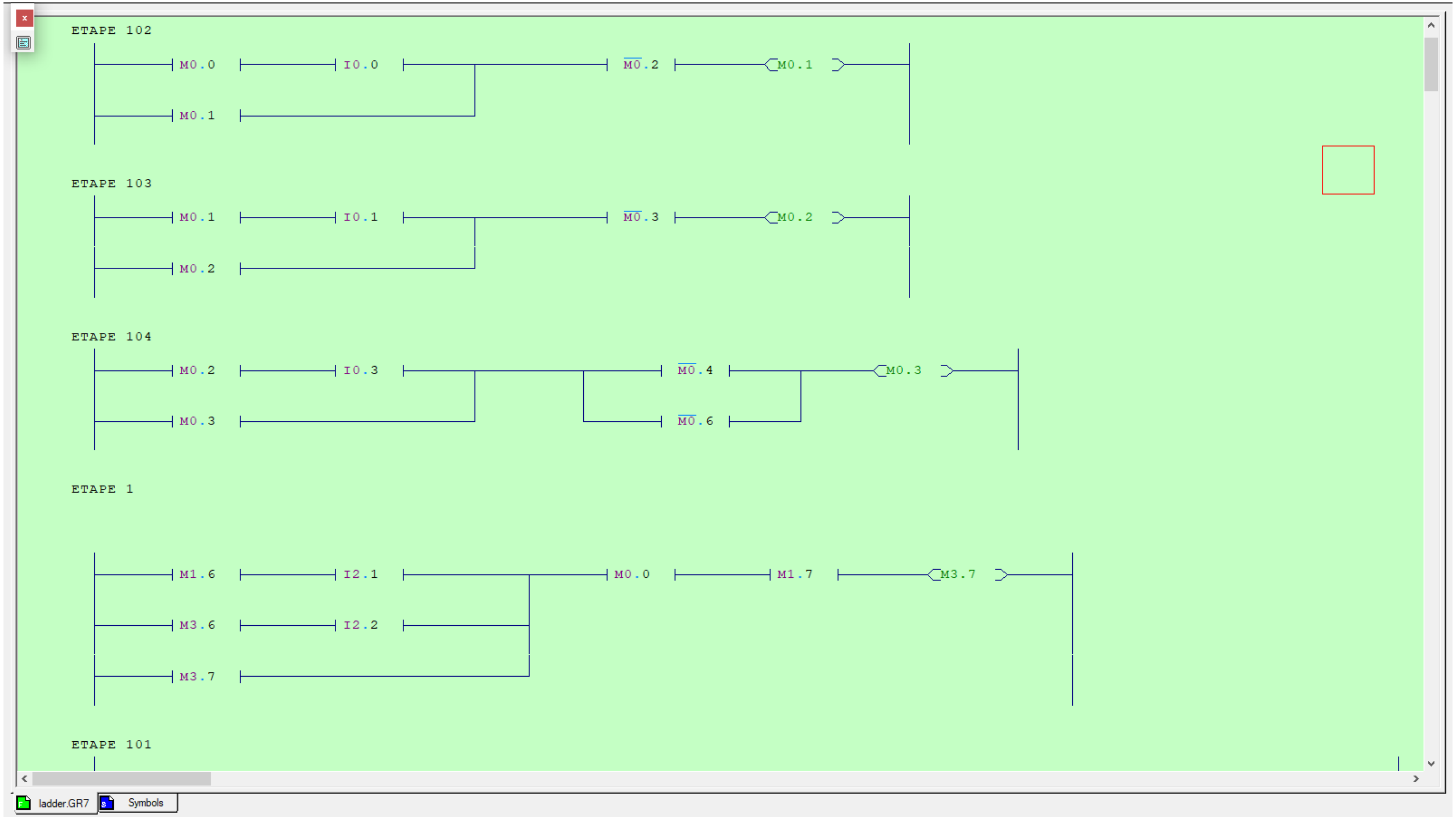


Figure 56 : LADDER language

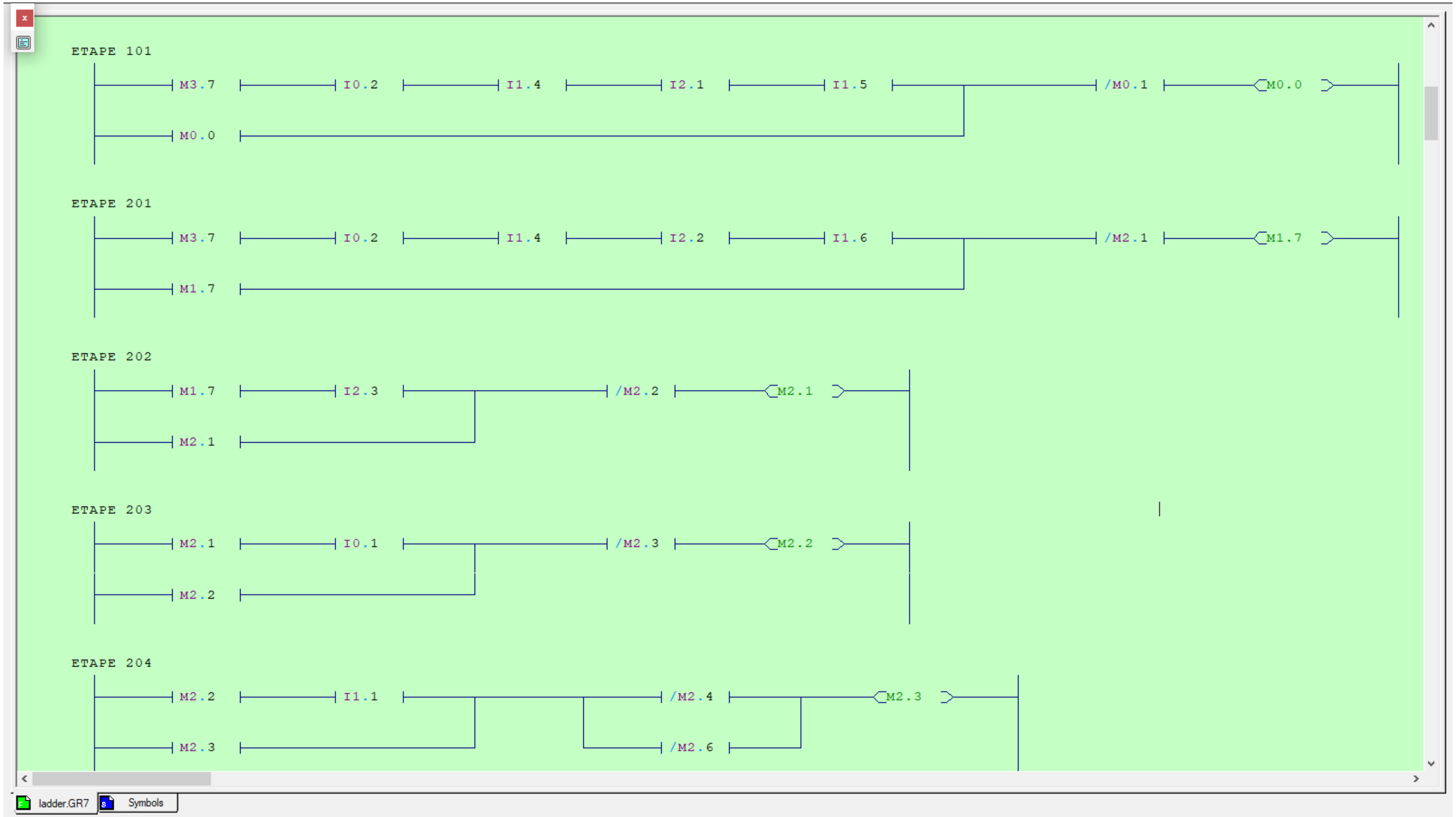


Figure 57: LADDER language

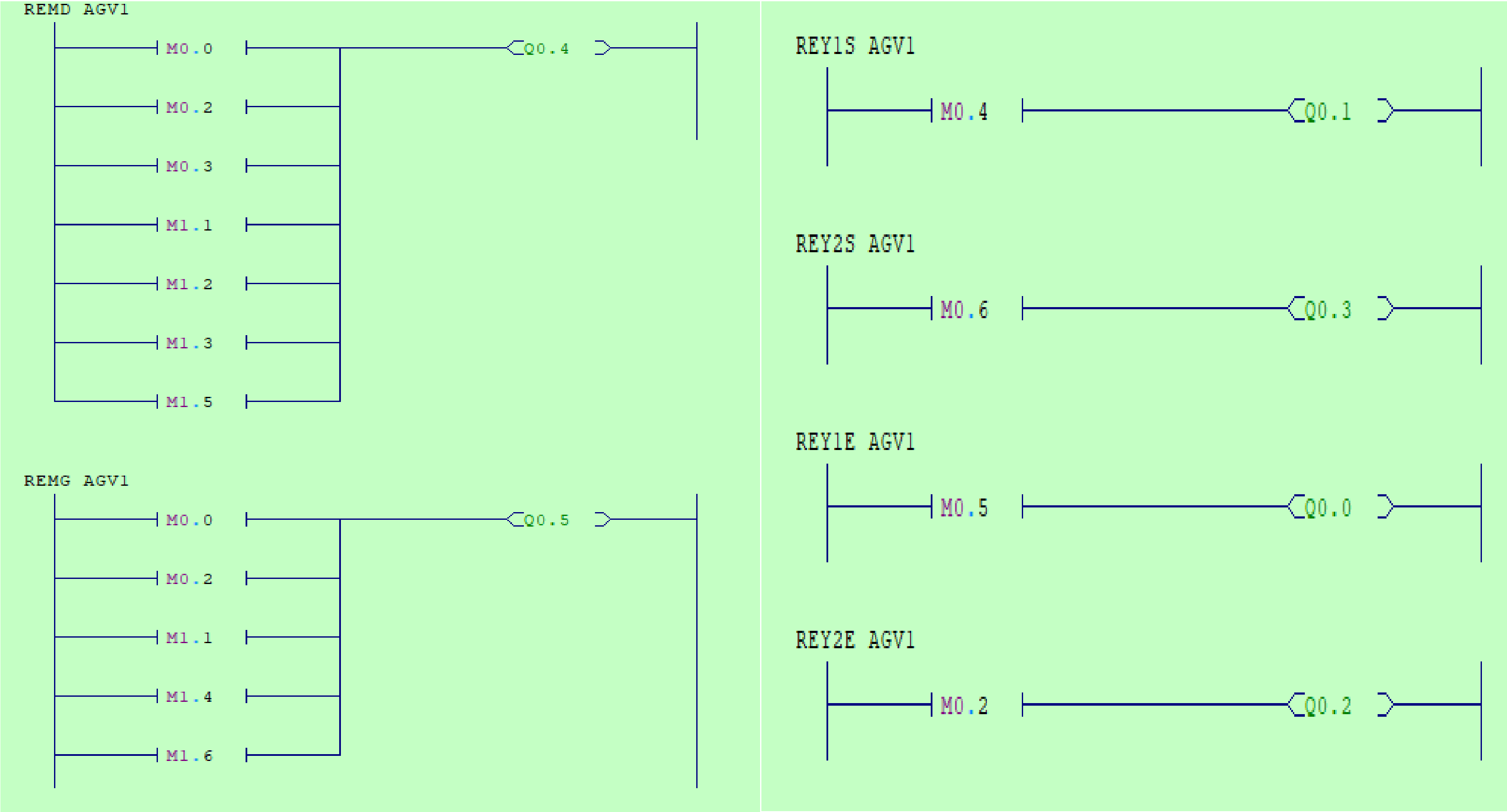


Figure 58 : LADDER language

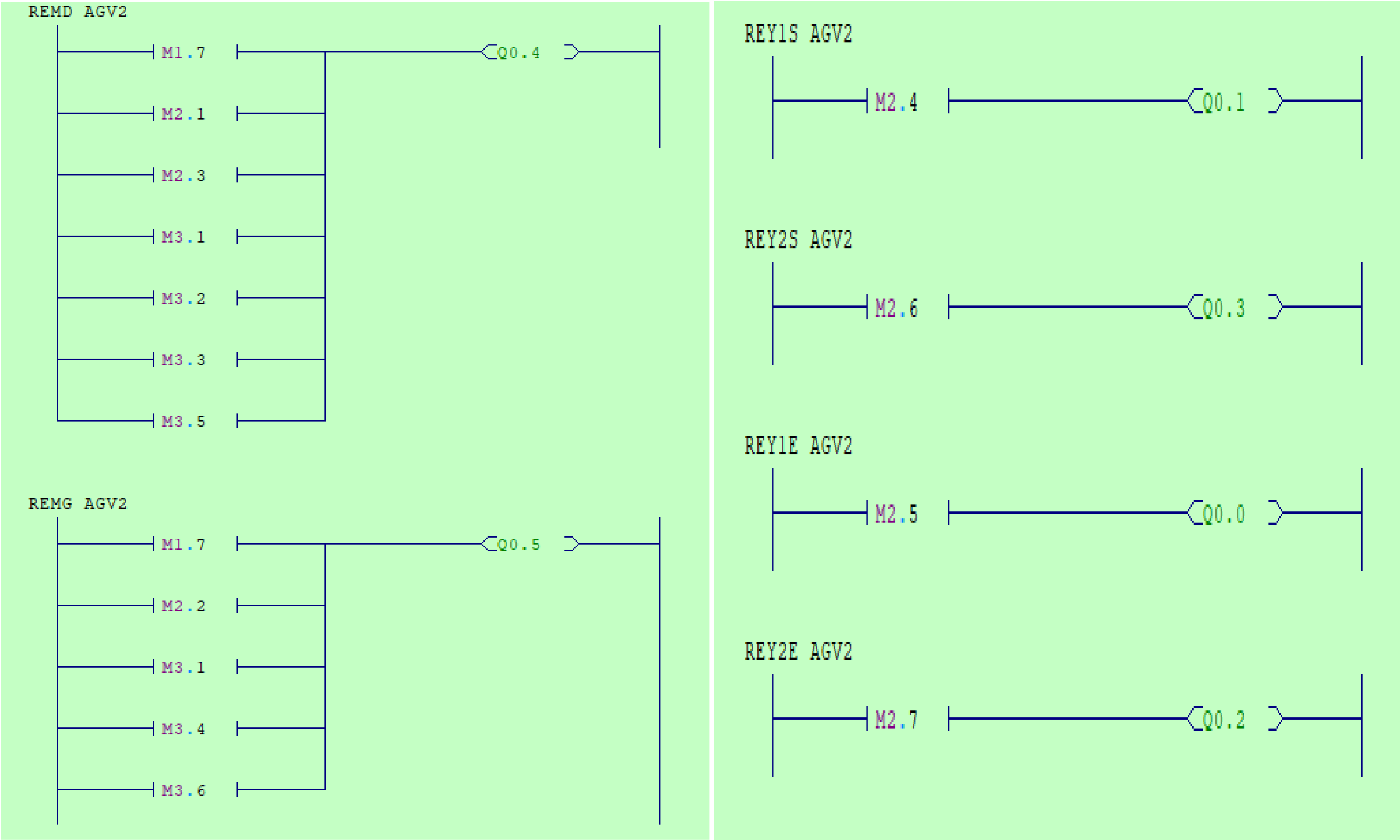


Figure 59: LADDER language

IL language: translation of previous examples of LD language into IL language

```
%I102:
LD      %M0.0
AND     %I0.0
OR      %M0.1
ANDN    %M0.2
ST      %M0.1
%I104:
LD      %M0.2
AND     %I0.3
OR      %M0.3
ANDN    (%M0.4
OR      %M0.6
)
ST      %M0.3
%I202:
LD      %M1.7
AND     %I2.3
OR      %M2.1
ANDN    %M2.2
ST      %M2.1
%I203:
LD      %M2.1
AND     %I0.1
OR      %M2.2
ANDN    %M2.3
ST      %M2.2
```

```
%I103:
LD      %M0.1
AND     %I0.1
OR      %M0.2
ANDN    %M0.3
ST      %M0.2
%I1:
LD      %M1.6
AND     %I2.1
OR      (%M3.6
AND     %I2.2
OR      %M3.7
)
ANDN    %M0.0
ANDN    %M1.7
ST      %M3.7

%I204:
LD      %M2.2
AND     %I1.1
OR      %M2.3
ANDN    (%M2.4
OR      %M2.6
)
ST      %M2.3

%REY2S AGV2
LD      %M2.6
ST      %Q0.3
```

```
%I101:
LD      %M3.7
AND     %I0.2
AND     %I1.4
AND     %I2.1
AND     %I1.5
OR      %M0.0
ANDN    %M0.1
ST      %M0.0
%I201:
LD      %M3.7
AND     %I0.2
AND     %I1.4
AND     %I2.2
AND     %I1.6
OR      %M1.7
ANDN    %M2.1
ST      %M1.7

%REMD AGV2:
LD      %M1.7
OR      (%M2.1
OR      %M2.3
OR      %M3.1
OR      %M3.2
OR      %M3.3
OR      %M3.5
)
ST      %Q0.4
```

%REMG AGV2:

```
LD      %M1.7
OR      (%M2.2
OR      %M3.1
OR      %M3.4
OR      %M3.6
)
ST      %Q0.5
```

%REY1E AGV2

```
LD      %M2.5
ST      %Q0.0
```

%REY2E AGV2

```
LD      %M2.7
ST      %Q0.2
```

%REY1S AGV2

```
LD      %M2.4
ST      %O0.1
```

%REMD AGV1:

```
LD      %M0.0
OR      (%M0.2
OR      %M0.3
OR      %M1.1
OR      %M1.2
OR      %M1.3
OR      %M1.5
)
ST      %Q0.4
```

%REMG AGV1:

```
LD      %M0.0
OR      (%M0.2
OR      %M1.1
OR      %M1.4
OR      %M1.6
)
ST      %Q0.5
```

%REY1S AGV1

```
LD      %M0.4
ST      %Q0.1
```

%REY2S AGV1

```
LD      %M0.6
ST      %Q0.3
```

%REY1E AGV1

```
LD      %M0.5
ST      %Q0.0
```

%REY2E AGV1

```
LD      %M0.2
ST      %Q0.2
```

4.5.5 Simulation and modeling with Anylogic

AnyLogic is a simulation tool developed by The AnyLogic Company. AnyLogic has a graphical modeling language and also makes it easy to extend the simulation model with Java code.

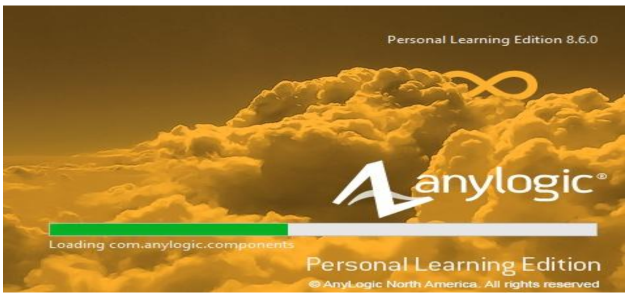


Figure 60 : AnyLogic software

- General mounting

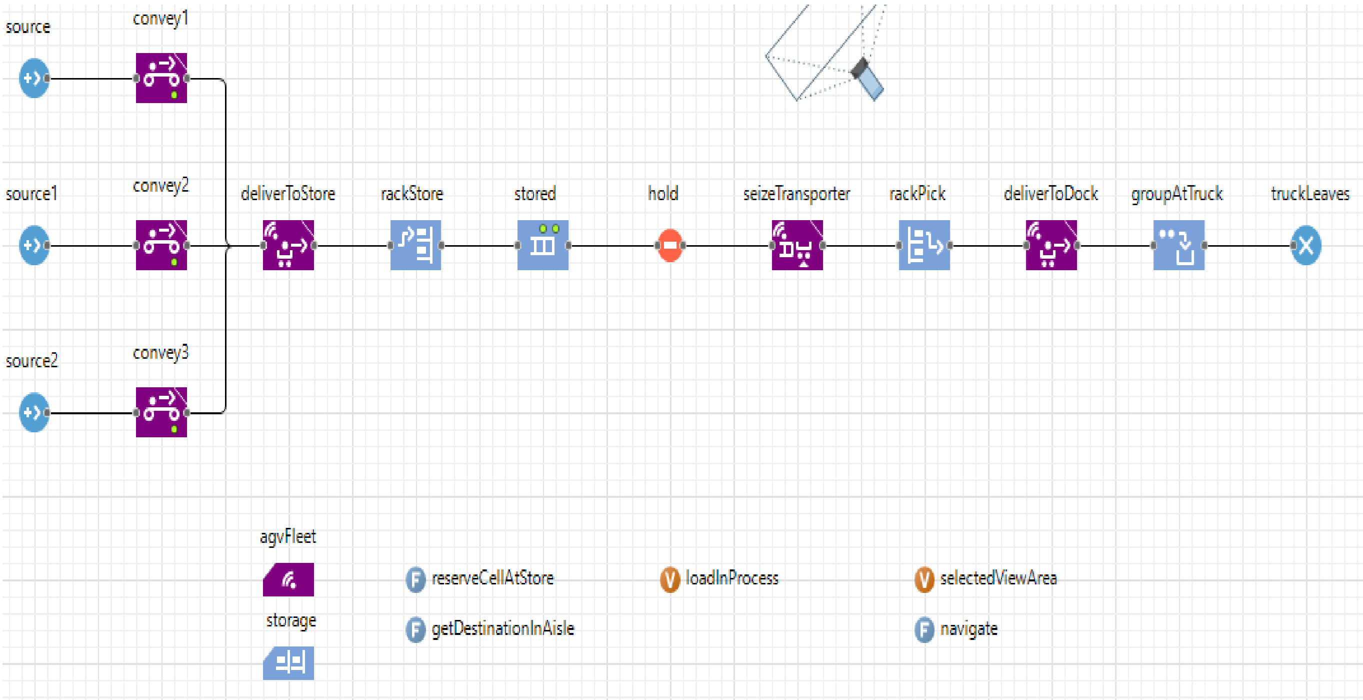


Figure 61: General mounting of the system

- Simulation

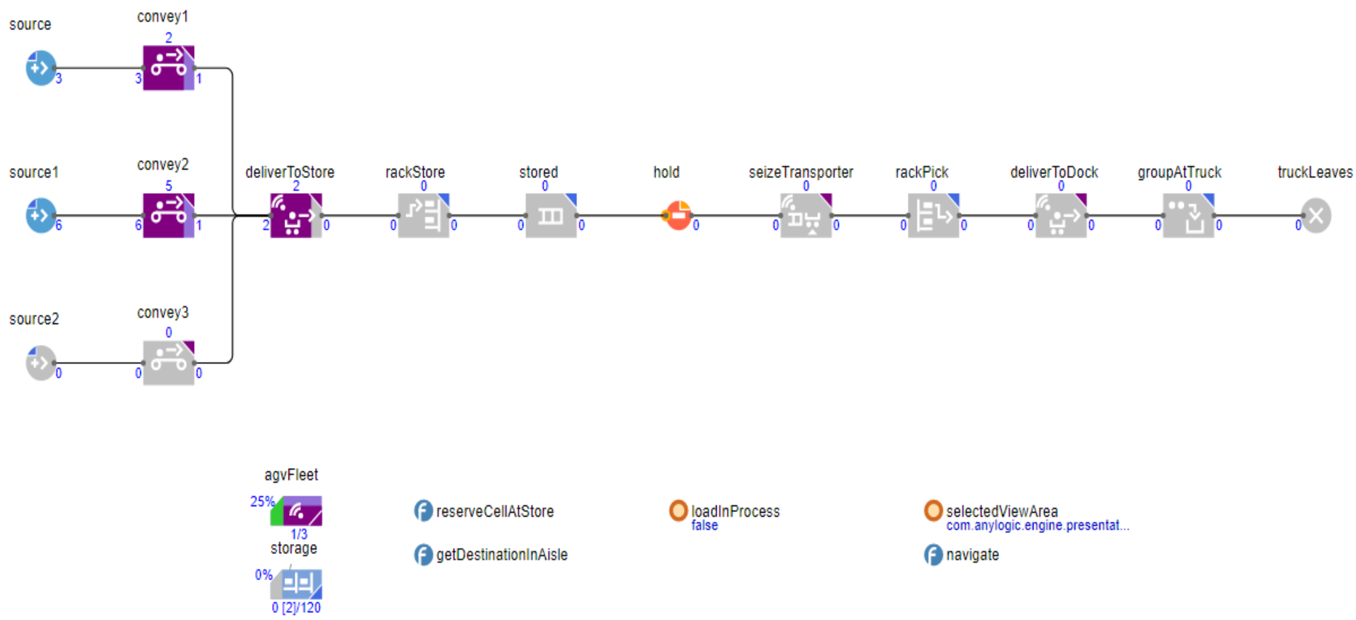


Figure 62 : Simulation with AnyLogic

- Simulation 3D (see appendix 3)

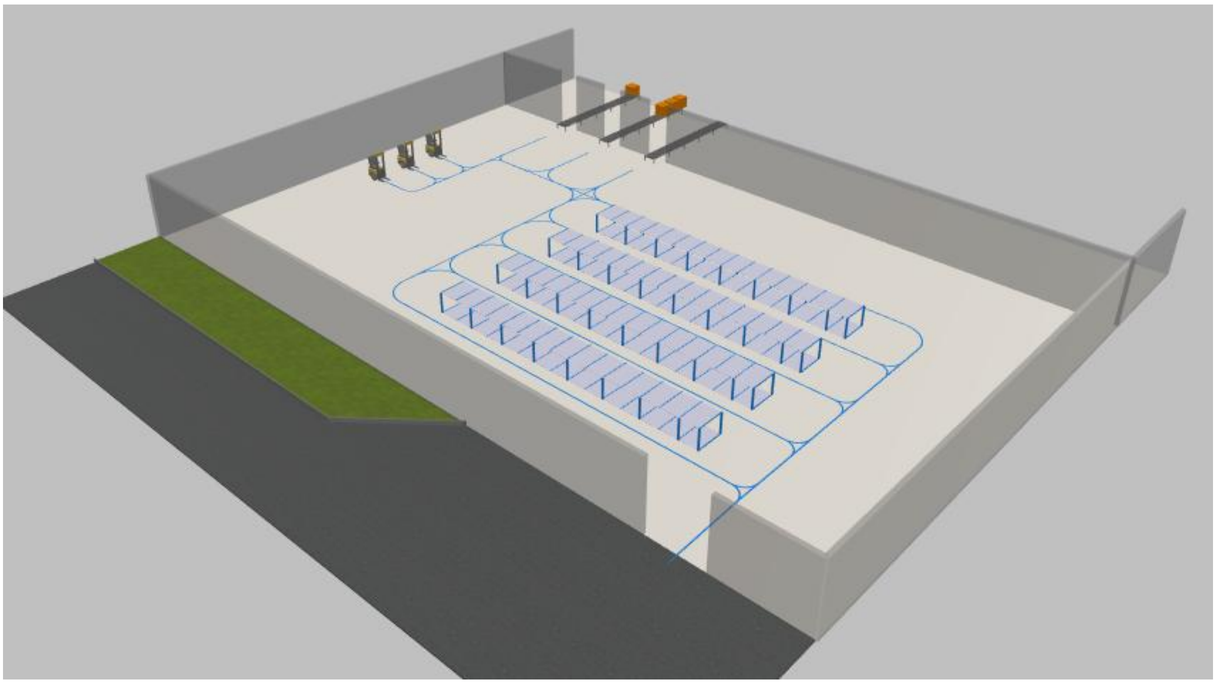


Figure 63: 3D modeling of the project space

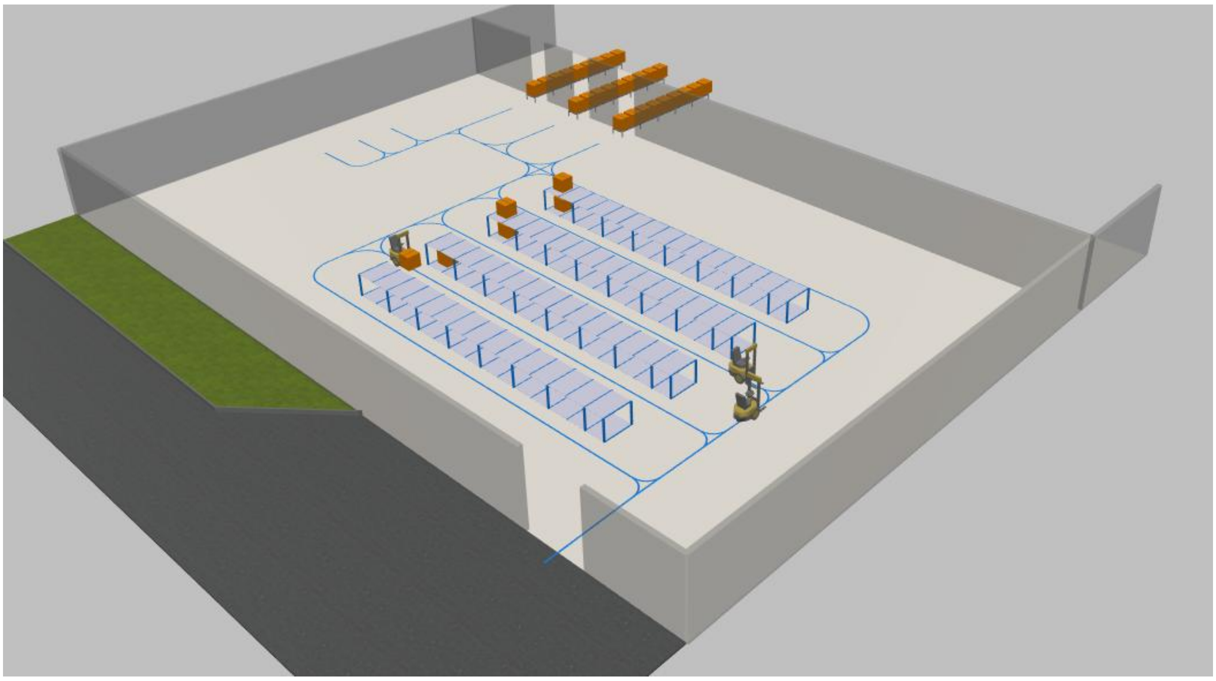


Figure 64: Simulation and 3D modeling initial stage

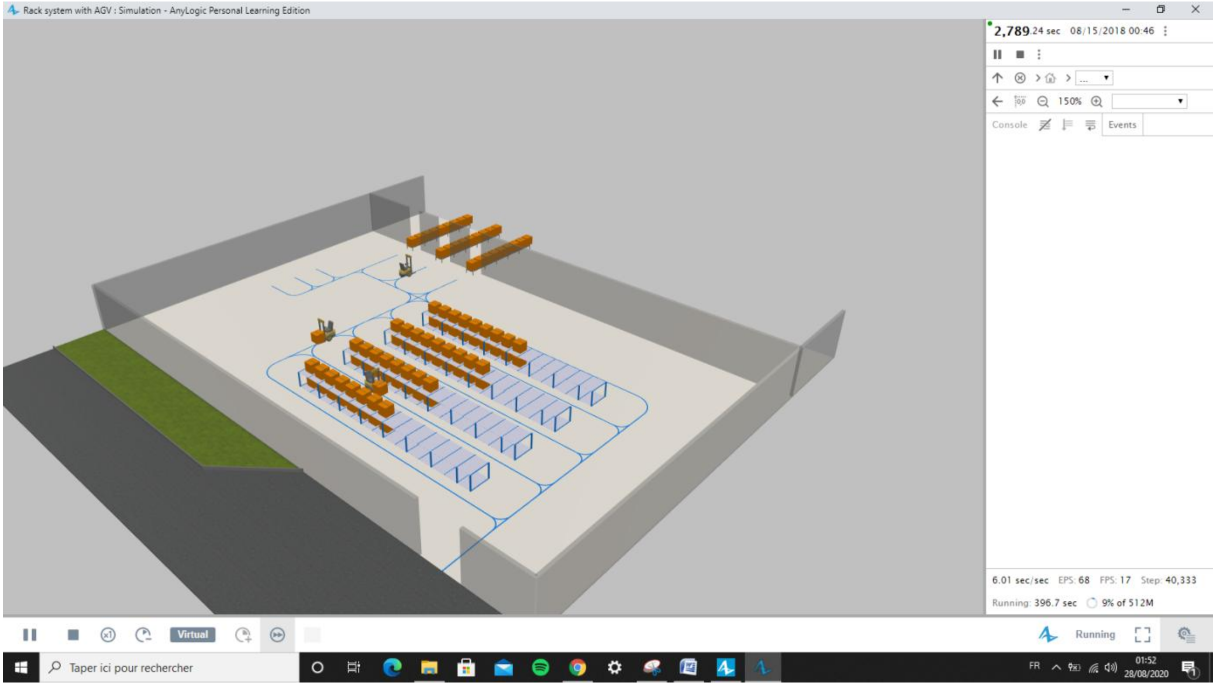


Figure 65: Intermediate 3D simulation and modeling

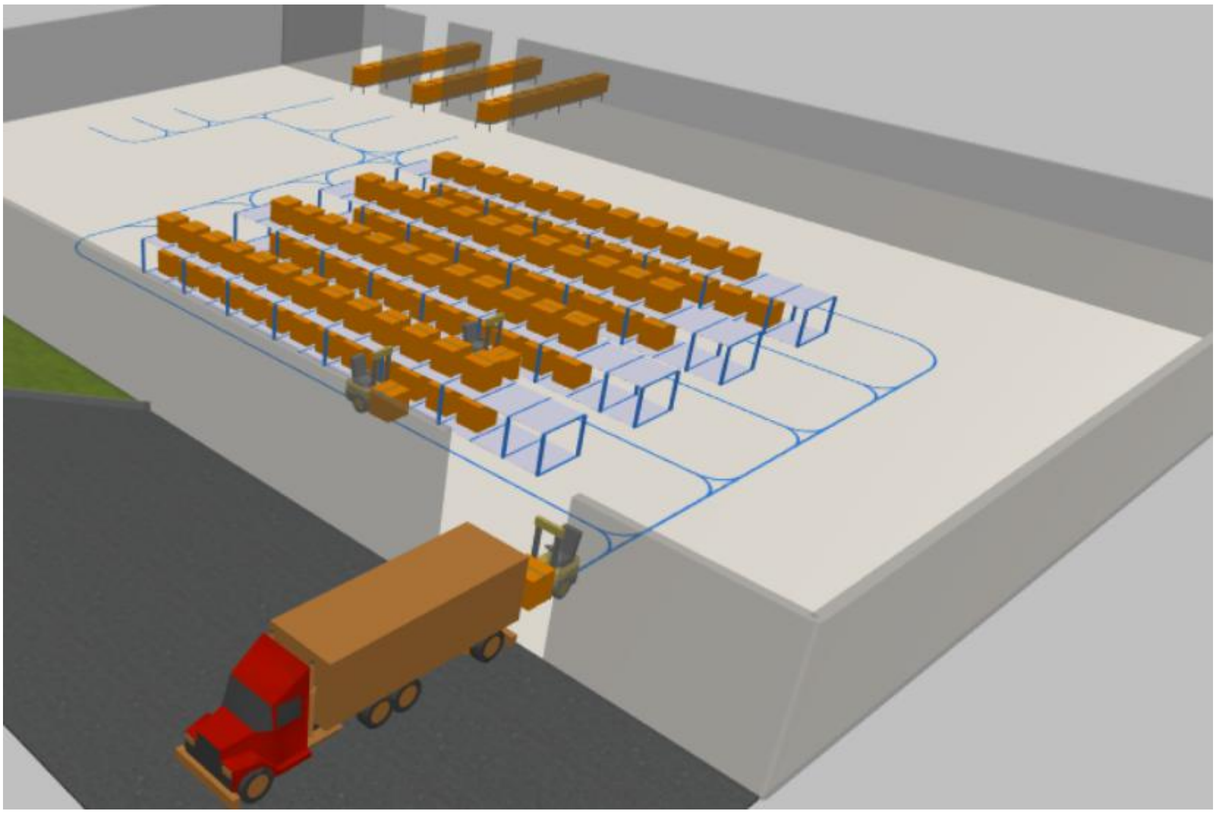


Figure 66: 3D simulation and modeling final step

CONCLUSION

In this chapter I carried out a modern technical study concerning the installation of an automatic transport system, going through the circuit study, the choice of control system, then the development of the PLC program on AUTOMGEN A8, then a realization of a 3D simulation and modeling system.

GENERAL CONCLUSION AND PERSPECTIVES

This internship that I carried out within the company SEBN TN, precisely in the quality department, was a profitable opportunity for discovering the world of work within a large company. I was able to benefit from a very rich experience in the field of automotive wiring and to discover its details, its elements, constraints ... and it gave me the opportunity to participate concretely in its challenges through my mission.

In a perspective of continuous innovation which is the main objective of the SEBN group and which offers me the opportunity to work on a modern subject concerning Industry 4.0, I started the work with a functional analysis which led me the idea of installing agv automated guided vehicles.

This study generally consists of:

• Study and layout of the agvs passage circuit according to the current zone.

• Automation and control of agvs

• 3D simulation and modeling according to the work circuit.

It should be noted that this internship also allowed me to learn a new idea about professional life; it is to be versatile, have the minimum in each area, serious, present physically and intellectually. This internship has also helped me to be more responsible for the task concerned and encourages me to gain access to the field of working life.

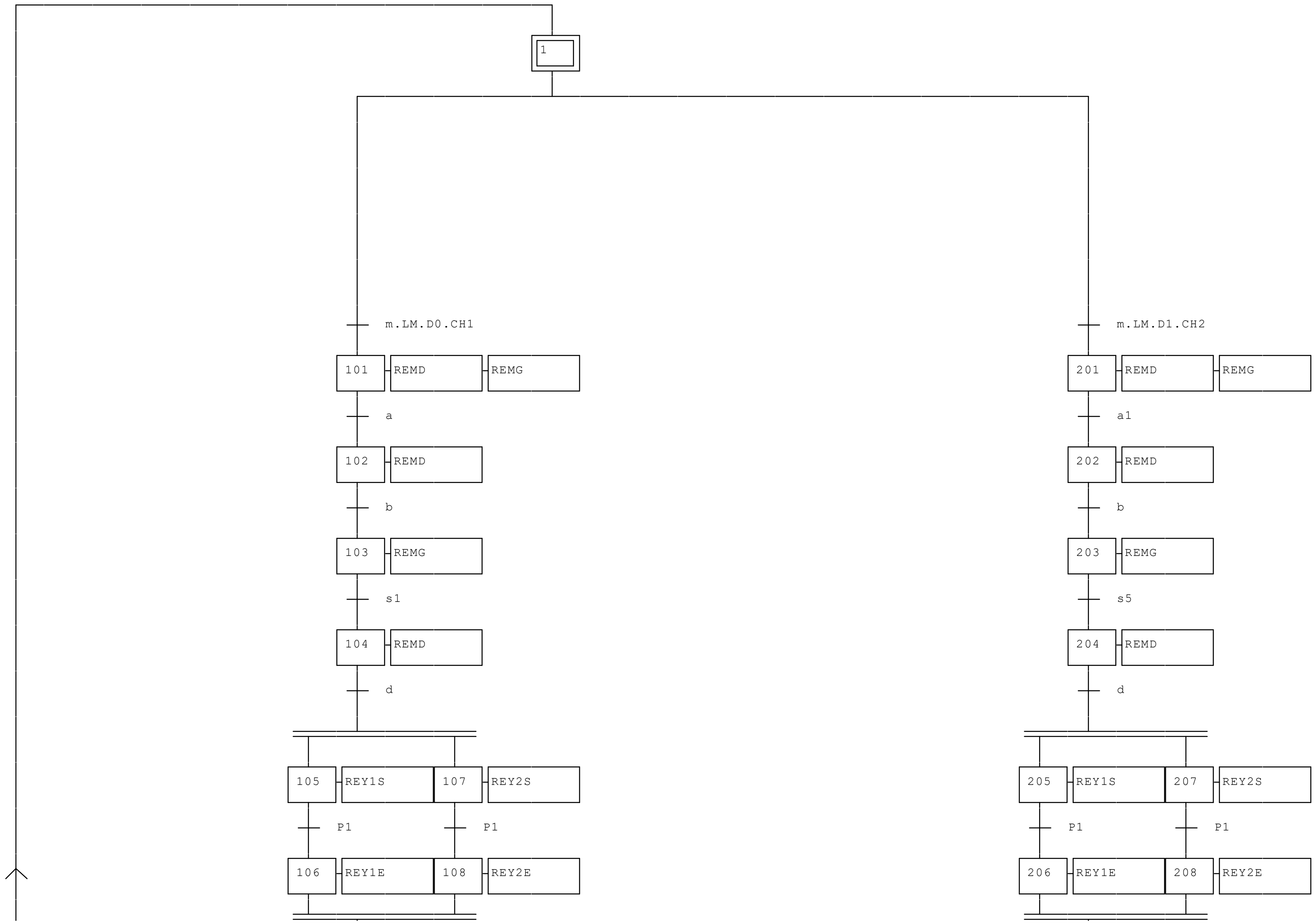
This project is very complicated in terms of study and practical realization, as the internship period is short 1 month and because of the infection of workers by the Covid 19 virus, the last week of internship was eliminated for interns for security reasons. So it was impossible to make a good advancement in both sides.

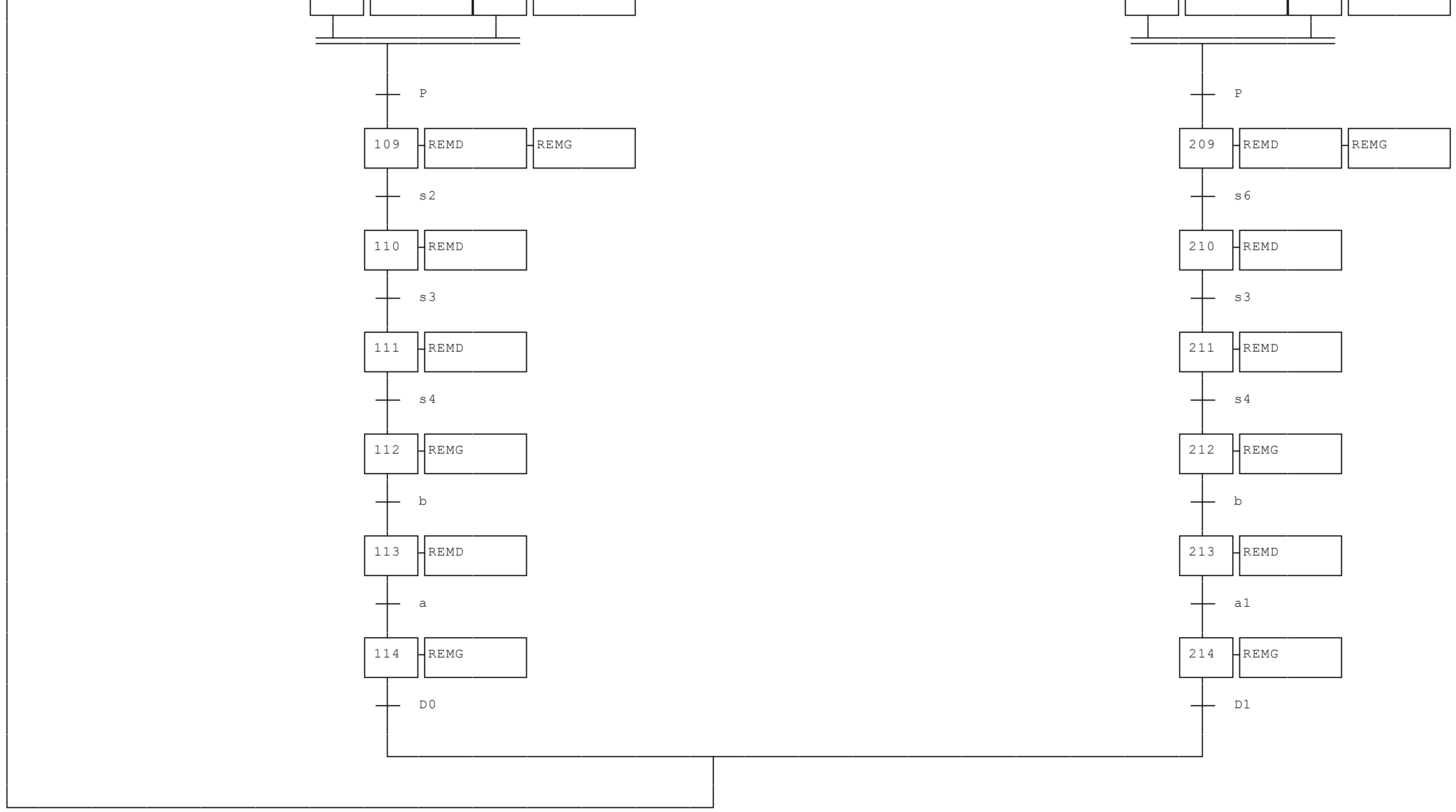
Prospects for the continuation and improvement of this project:

- Study and mechanical design of the AGV.
- Practical realization with materials.
- Development of a personal control program and interface as another solution.

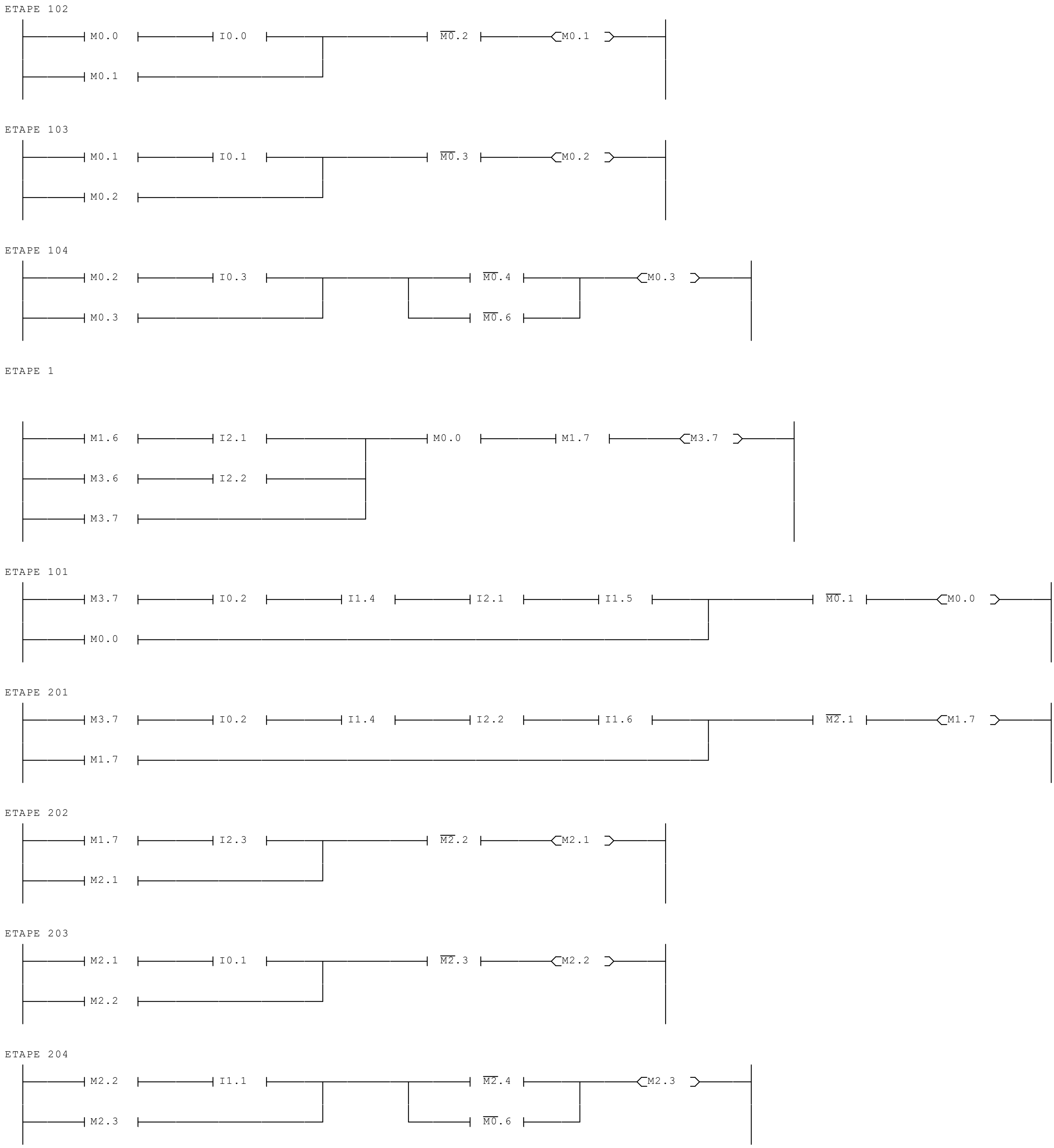
APPENDICES

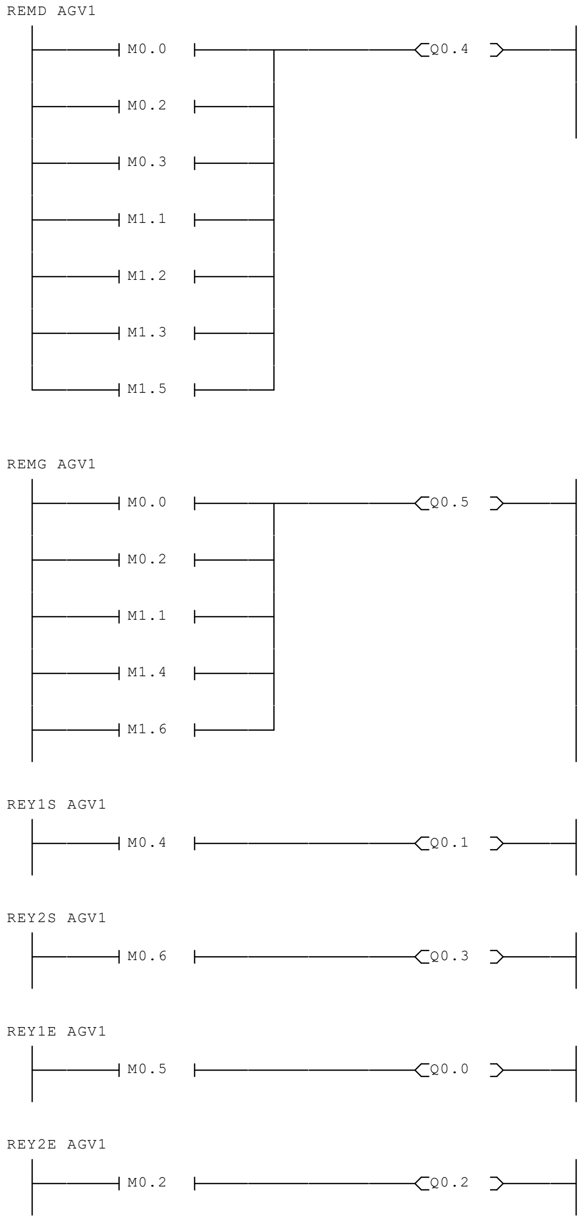
APPENDIX 1


1
m.LM.D0.CH1
101
REMD
REMG
a
102
REMD
b
103
REMG
s1
104
REMD
d
105
REY1S
107
REY2S
P1
P1
106
REY1E
108
REY2E
m.LM.D1.CH2
201
REMD
REMG
a1
202
REMD
b
203
REMG
s5
204
REMD
d
205
REY1S
207
REY2S
P1
P1
206
REY1E
208
REY2E

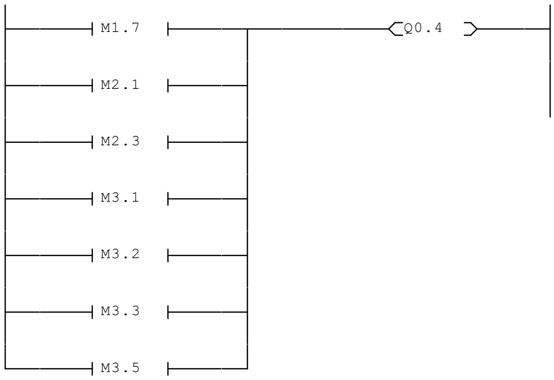

P
109
REMD
REMG
s2
110
REMD
s3
111
REMD
s4
112
REMG
b
113
REMD
a
114
REMG
D0
P
209
REMD
REMG
s6
210
REMD
s3
211
REMD
s4
212
REMG
b
213
REMD
a1
214
REMG
D1

APPENDIX 2

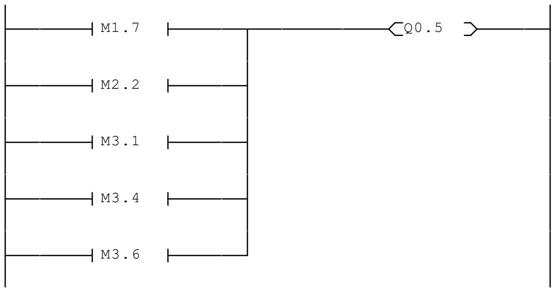

ETAPE 102
M0.0 I0.0 M0.2 M0.1
M0.1
ETAPE 103
M0.1 I0.1 M0.3 M0.2
M0.2
ETAPE 104
M0.2 I0.3 M0.4 M0.3
M0.3 M0.6
ETAPE 1
M1.6 I2.1 M0.0 M1.7 M3.7
M3.6 I2.2
M3.7
ETAPE 101
M3.7 I0.2 I1.4 I2.1 I1.5 M0.1 M0.0
M0.0
ETAPE 201
M3.7 I0.2 I1.4 I2.2 I1.6 M2.1 M1.7
M1.7
ETAPE 202
M1.7 I2.3 M2.2 M2.1
M2.1
ETAPE 203
M2.1 I0.1 M2.3 M2.2
M2.2
ETAPE 204
M2.2 I1.1 M2.4 M2.3
M2.3 M0.6


REMD AGV1
M0.0
M0.2
M0.3
M1.1
M1.2
M1.3
M1.5
Q0.4
REMG AGV1
M0.0
M0.2
M1.1
M1.4
M1.6
Q0.5
REY1S AGV1
M0.4
Q0.1
REY2S AGV1
M0.6
Q0.3
REY1E AGV1
M0.5
Q0.0
REY2E AGV1
M0.2
Q0.2

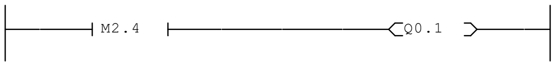
REMD AGV2



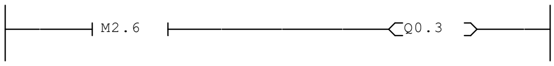
REMG AGV2



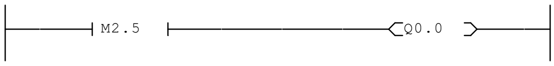
REY1S AGV2



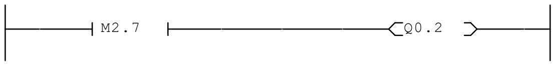
REY2S AGV2



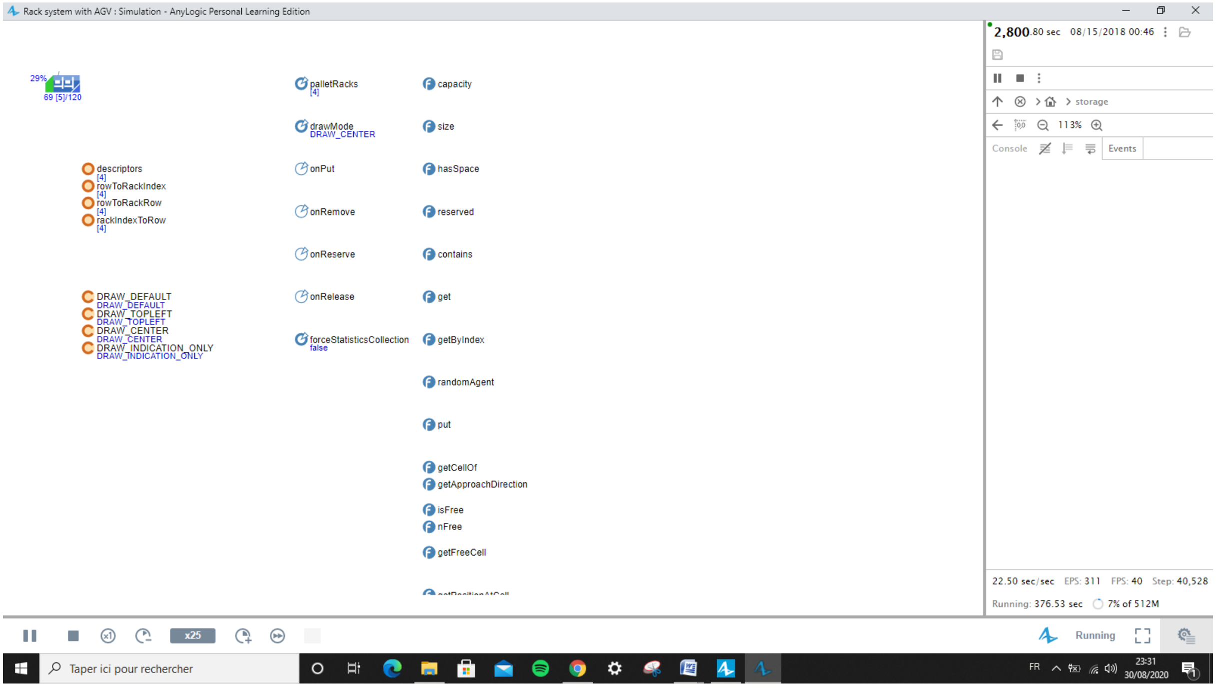
REY1E AGV2

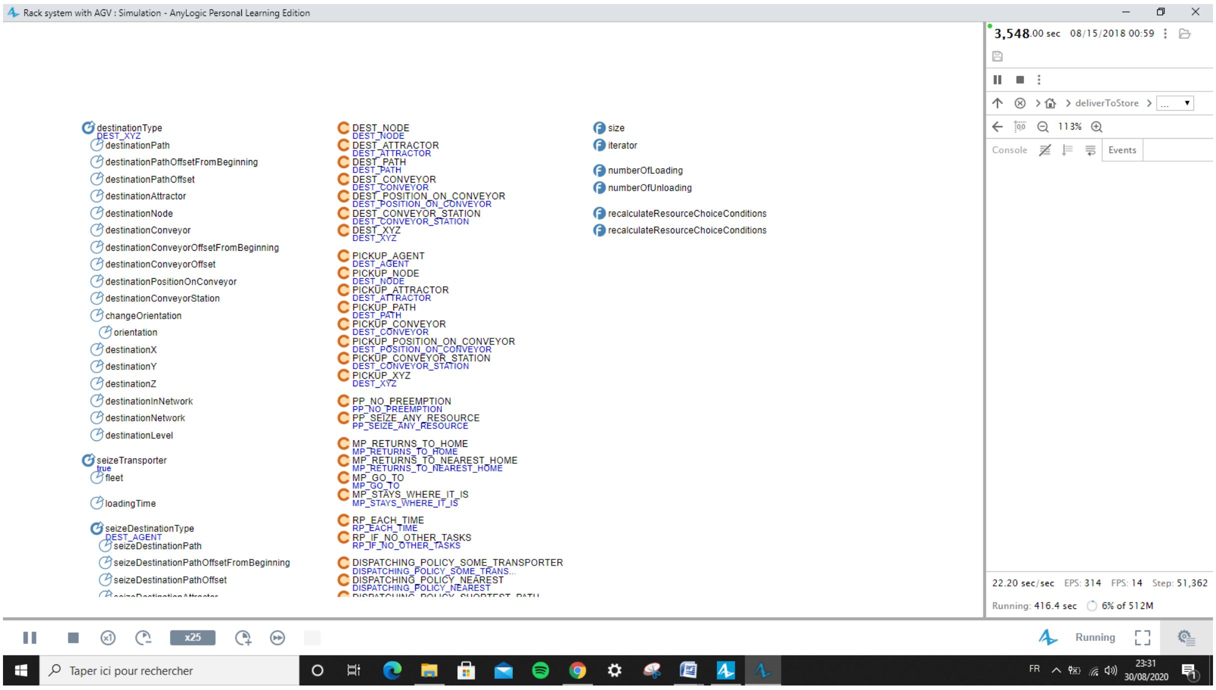


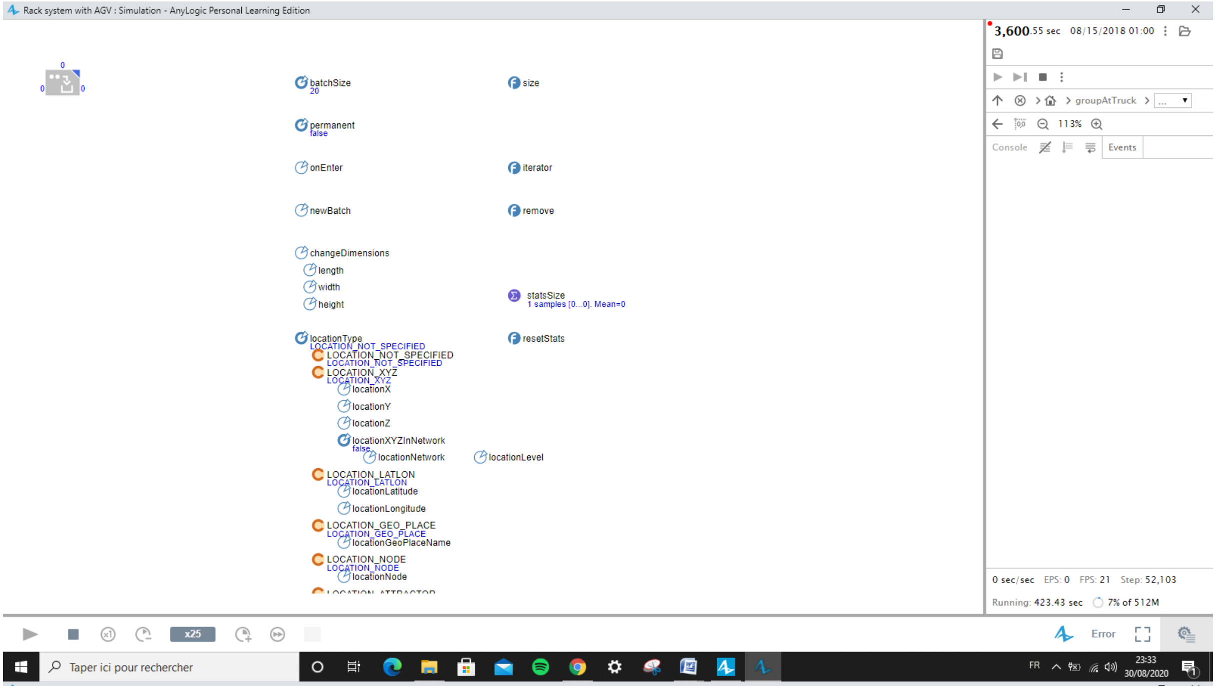
REY2E AGV2

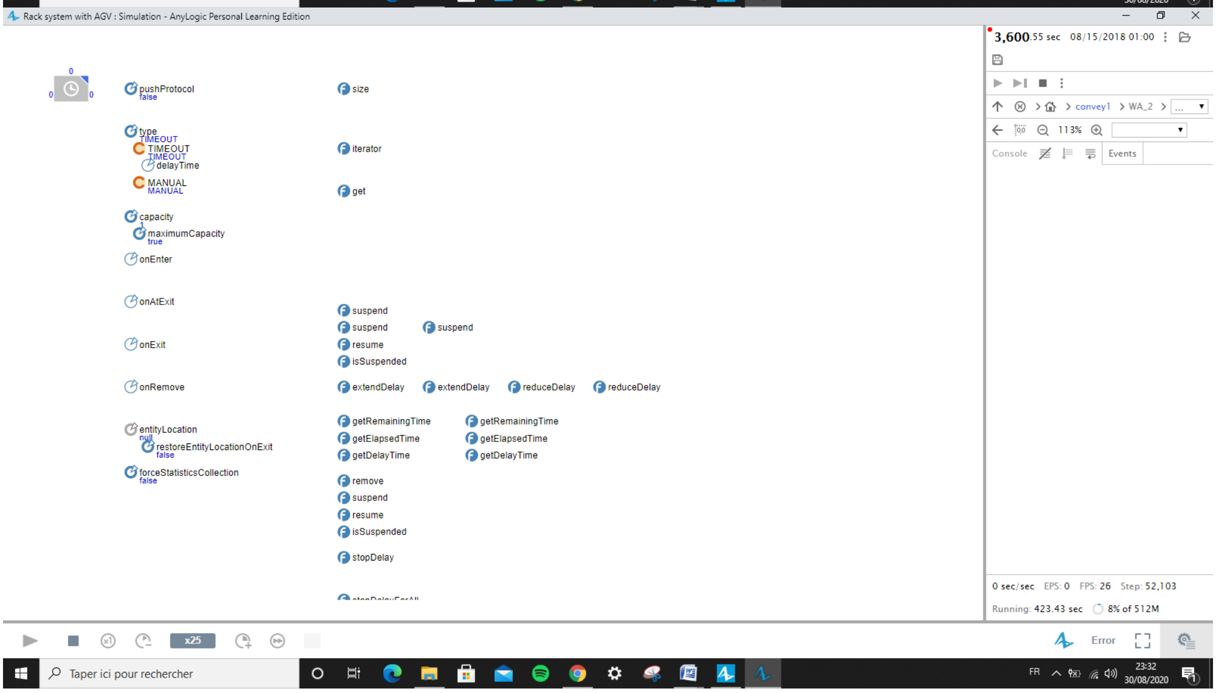


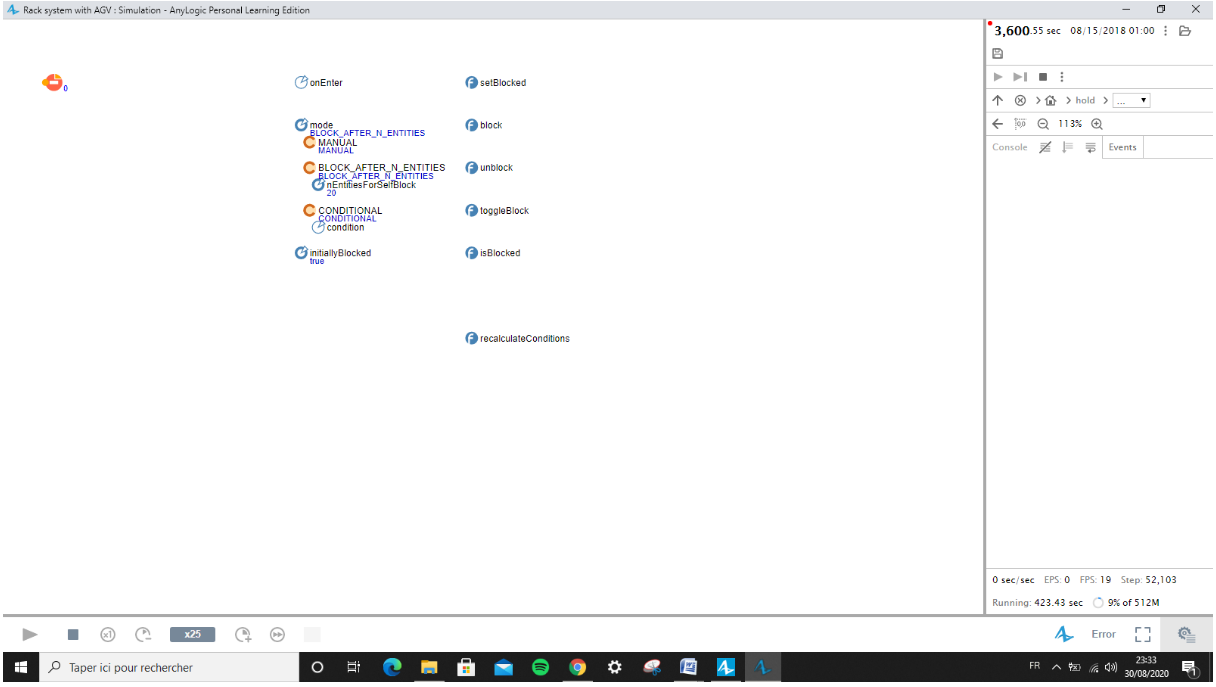
APPENDIX 3

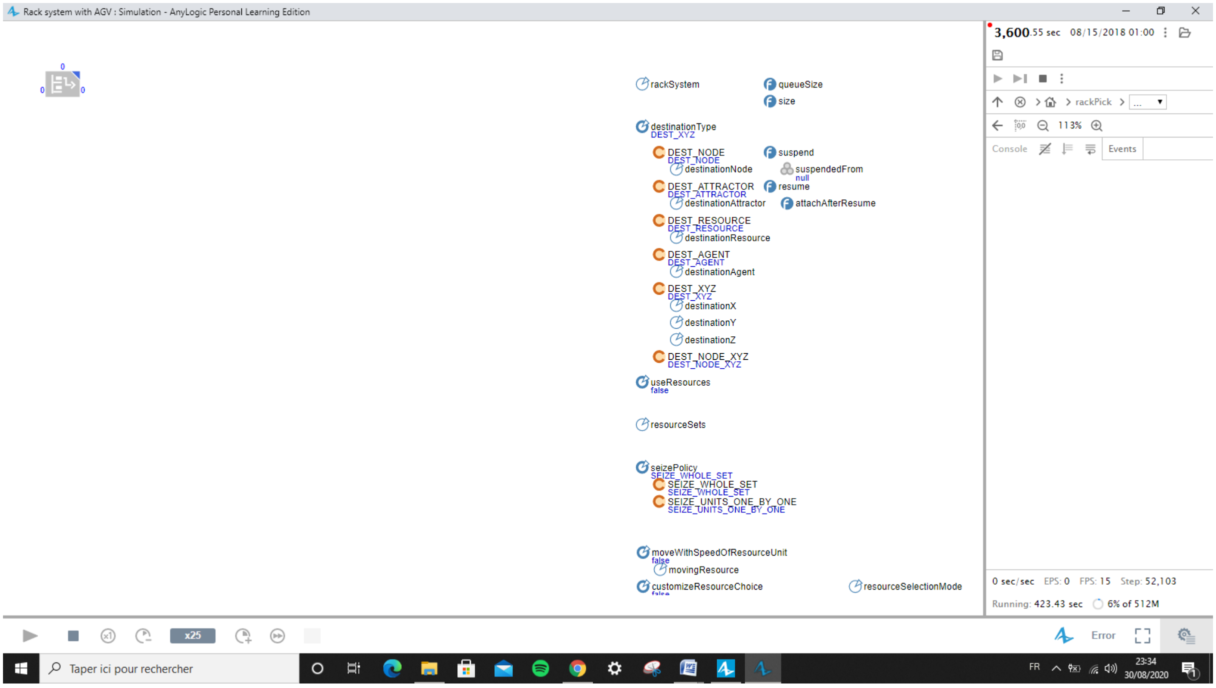

Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
2,800.80 sec 08/15/2018 00:46
storage
113%
Console
Events
palletRacks
drawMode
DRAW_CENTER
onPut
onRemove
onReserve
onRelease
forceStatisticsCollection
false
capacity
size
hasSpace
reserved
contains
get
getByIndex
randomAgent
put
getCellOf
getApproachDirection
isFree
nFree
getFreeCell
descriptors
rowToRackIndex
rowToRackRow
rackIndexToRow
DRAW_DEFAULT
DRAW_TOPLEFT
DRAW_CENTER
DRAW_INDICATION_ONLY
22.50 sec/sec EPS: 311 FPS: 40 Step: 40,528
Running: 376.53 sec 7% of 512M
x25
Running
Taper ici pour rechercher
FR
23:31
30/08/2020

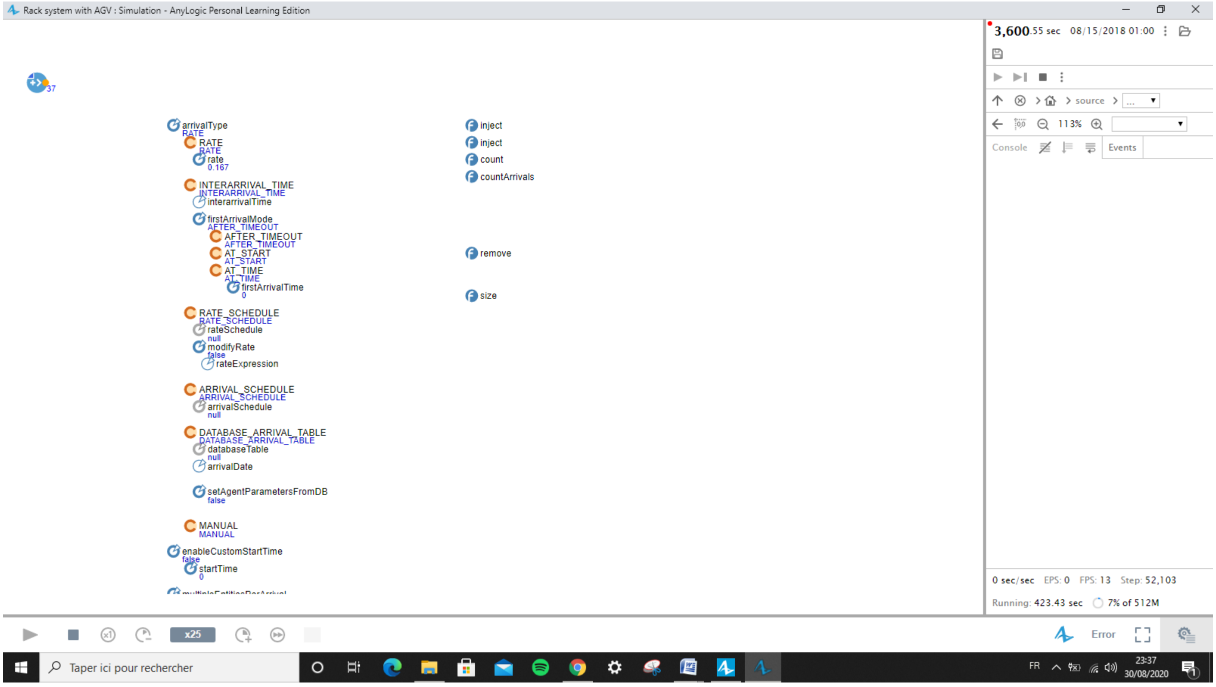

Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
3,548.00 sec 08/15/2018 00:59
deliverToStore
113%
Console
Events
destinationType
DEST_XYZ
destinationPath
destinationPathOffsetFromBeginning
destinationPathOffset
destinationAttractor
destinationNode
destinationConveyor
destinationConveyorOffsetFromBeginning
destinationConveyorOffset
destinationPositionOnConveyor
destinationConveyorStation
changeOrientation
orientation
destinationX
destinationY
destinationZ
destinationInNetwork
destinationNetwork
destinationLevel
seizeTransporter
true
fleet
loadingTime
seizeDestinationType
DEST_AGENT
seizeDestinationPath
seizeDestinationPathOffsetFromBeginning
seizeDestinationPathOffset
DEST_NODE
DEST_ATTRACTOR
DEST_PATH
DEST_CONVEYOR
DEST_POSITION_ON_CONVEYOR
DEST_CONVEYOR_STATION
DEST_XYZ
PICKUP_AGENT
PICKUP_NODE
PICKUP_ATTRACTOR
PICKUP_PATH
PICKUP_CONVEYOR
PICKUP_POSITION_ON_CONVEYOR
PICKUP_CONVEYOR_STATION
PICKUP_XYZ
PP_NO_PREEMPTION
PP_SEIZE_ANY_RESOURCE
MP_RETURNS_TO_HOME
MP_RETURNS_TO_NEAREST_HOME
MP_GO_TO
MP_STAYS_WHERE_IT_IS
RP_EACH_TIME
RP_IF_NO_OTHER_TASKS
DISPATCHING_POLICY_SOME_TRANSPORTER
DISPATCHING_POLICY_NEAREST
size
iterator
numberOfLoading
numberOfUnloading
recalculateResourceChoiceConditions
22.20 sec/sec EPS: 314 FPS: 14 Step: 51,362
Running: 416.4 sec 6% of 512M
x25
Running
Taper ici pour rechercher
FR
23:31
30/08/2020

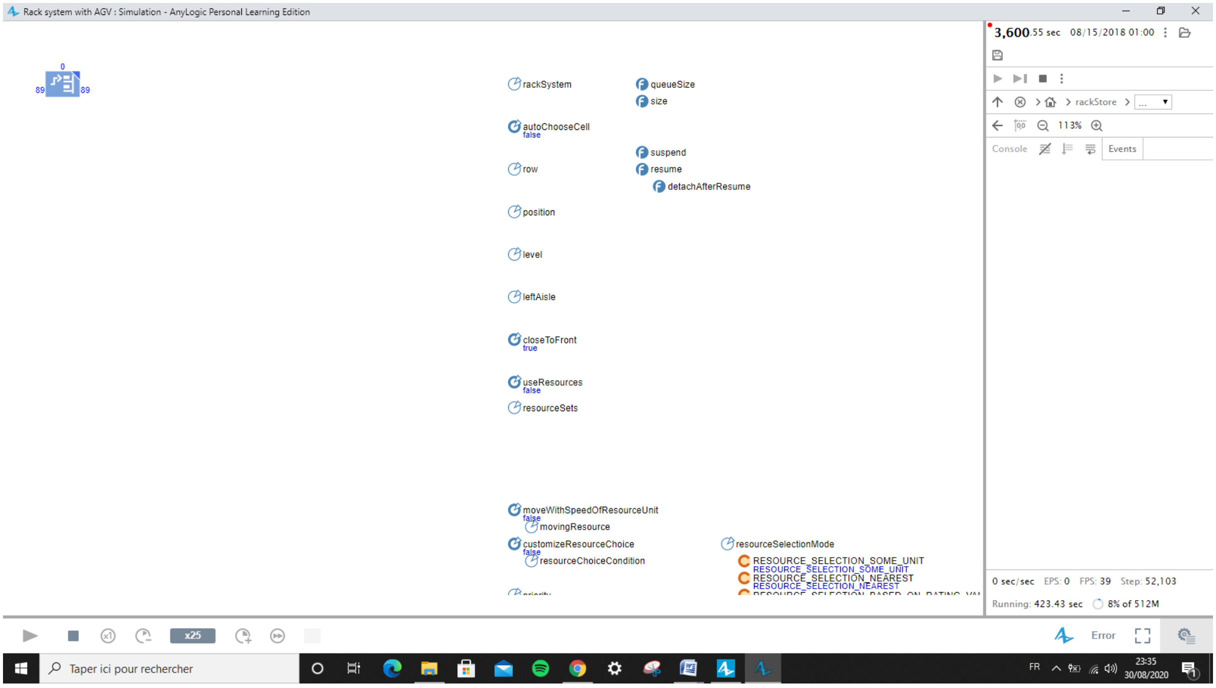

Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
batchSize
20
size
permanent
false
onEnter
iterator
newBatch
remove
changeDimensions
length
width
height
statsSize
1 samples [0...0], Mean=0
locationType
LOCATION_NOT_SPECIFIED
resetStats
LOCATION_NOT_SPECIFIED
LOCATION_XYZ
locationX
locationY
locationZ
locationXYZInNetwork
false
locationNetwork
locationLevel
LOCATION_LATLON
locationLatitude
locationLongitude
LOCATION_GEO_PLACE
locationGeoPlaceName
LOCATION_NODE
locationNode
3,600.55 sec 08/15/2018 01:00
groupAtTruck
113%
Console
Events
0 sec/sec EPS: 0 FPS: 21 Step: 52,103
Running: 423.43 sec 7% of 512M
x25
Error
Taper ici pour rechercher
FR
23:33
30/08/2020

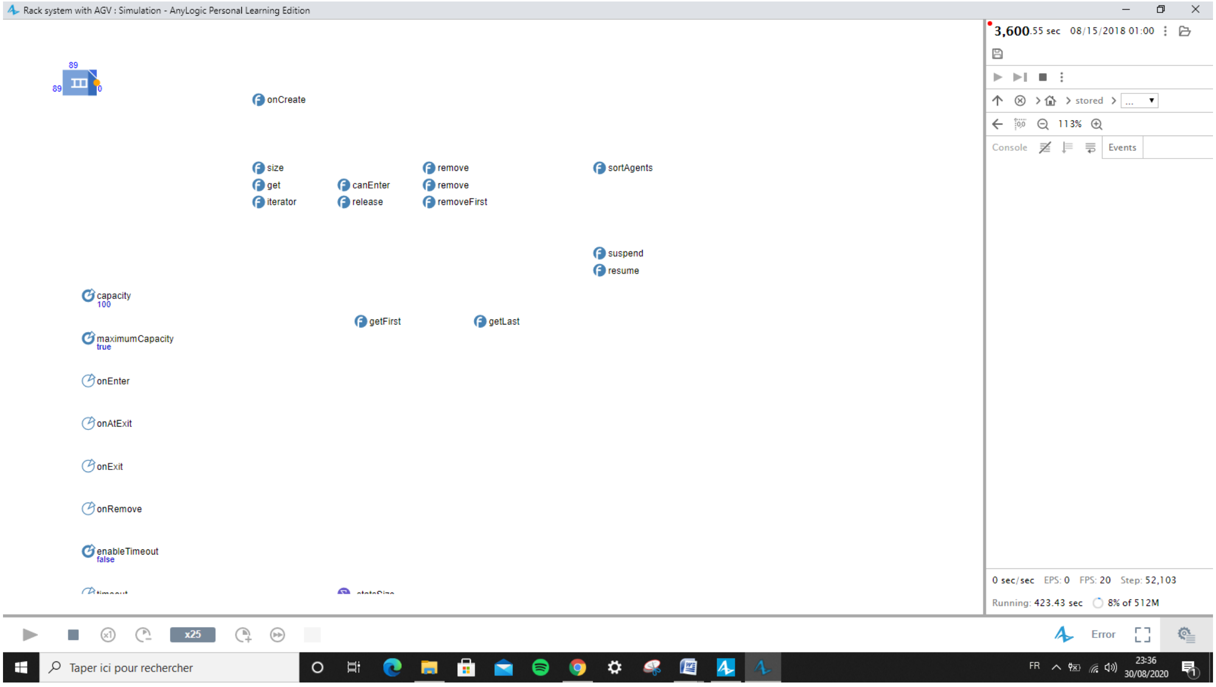

Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
pushProtocol
false
size
type
TIMEOUT
TIMEOUT
delayTime
iterator
MANUAL
get
capacity
maximumCapacity
true
onEnter
onAtExit
suspend
suspend
suspend
onExit
resume
isSuspended
onRemove
extendDelay
extendDelay
reduceDelay
reduceDelay
entityLocation
null
getRemainingTime
getRemainingTime
restoreEntityLocationOnExit
false
getElapsedTime
getElapsedTime
forceStatisticsCollection
false
getDelayTime
getDelayTime
remove
suspend
resume
isSuspended
stopDelay
3,600.55 sec 08/15/2018 01:00
convey1
WA_2
113%
Console
Events
0 sec/sec EPS: 0 FPS: 26 Step: 52,103
Running: 423.43 sec 8% of 512M
x25
Error
Taper ici pour rechercher
FR
23:32
30/08/2020


Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
onEnter
setBlocked
mode
BLOCK_AFTER_N_ENTITIES
MANUAL
block
BLOCK_AFTER_N_ENTITIES
nEntitiesForSelfBlock
unblock
CONDITIONAL
condition
toggleBlock
initiallyBlocked
true
isBlocked
recalculateConditions
3,600.55 sec 08/15/2018 01:00
hold
113%
Console
Events
0 sec/sec EPS: 0 FPS: 19 Step: 52,103
Running: 423.43 sec 9% of 512M
x25
Error
Taper ici pour rechercher
FR
23:33
30/08/2020


Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
rackSystem
queueSize
size
destinationType
DEST_XYZ
DEST_NODE
destinationNode
suspend
suspendedFrom
null
DEST_ATTRACTOR
destinationAttractor
resume
attachAfterResume
DEST_RESOURCE
destinationResource
DEST_AGENT
destinationAgent
DEST_XYZ
destinationX
destinationY
destinationZ
DEST_NODE_XYZ
useResources
false
resourceSets
seizePolicy
SEIZE_WHOLE_SET
SEIZE_UNITS_ONE_BY_ONE
moveWithSpeedOfResourceUnit
false
movingResource
customizeResourceChoice
resourceSelectionMode
3,600.55 sec 08/15/2018 01:00
rackPick
113%
Console
Events
0 sec/sec EPS: 0 FPS: 15 Step: 52,103
Running: 423.43 sec 6% of 512M
x25
Error
Taper ici pour rechercher
FR
23:34
30/08/2020


Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
arrivalType
RATE
interarrivalTime
firstArrivalMode
AFTER_TIMEOUT
AT_START
AT_TIME
firstArrivalTime
RATE_SCHEDULE
rateSchedule
modifyRate
rateExpression
ARRIVAL_SCHEDULE
arrivalSchedule
DATABASE_ARRIVAL_TABLE
databaseTable
arrivalDate
setAgentParametersFromDB
MANUAL
enableCustomStartTime
startTime
inject
count
countArrivals
remove
size
3,600.55 sec 08/15/2018 01:00
source
113%
Console
Events
Running: 423.43 sec 7% of 512M
Taper ici pour rechercher
23:37
30/08/2020


Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
rackSystem
autoChooseCell
row
position
level
leftAisle
closeToFront
useResources
resourceSets
moveWithSpeedOfResourceUnit
movingResource
customizeResourceChoice
resourceChoiceCondition
queueSize
size
suspend
resume
detachAfterResume
resourceSelectionMode
RESOURCE_SELECTION_SOME_UNIT
RESOURCE_SELECTION_NEAREST
3,600.55 sec 08/15/2018 01:00
rackStore
113%
Console
Events
Running: 423.43 sec 8% of 512M
Taper ici pour rechercher
23:35
30/08/2020



Rack system with AGV : Simulation - AnyLogic Personal Learning Edition
onCreate
size
get
iterator
canEnter
release
remove
remove
removeFirst
sortAgents
suspend
resume
capacity
100
getFirst
getLast
maximumCapacity
true
onEnter
onAtExit
onExit
onRemove
enableTimeout
false
3,600.55 sec 08/15/2018 01:00
stored
113%
Console
Events
0 sec/sec EPS: 0 FPS: 20 Step: 52,103
Running: 423.43 sec 8% of 512M
x25
Error
Taper ici pour rechercher
FR
23:36
30/08/2020

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www.anylogic.fr

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RESUME

Le présent document est la synthèse de mon travail dans le cadre d'un stage de perfectionnement. Dans le contenu de ce rapport, je vais présente le cycle de production des câbles automobile dans la société « SEBN-TN ». Je vais essayer de faire une solution de l'industrie 4.0 concernant une installation de véhicules à guidage automatique AGV.

SUMMARY

This document is the summary of my work within the framework of internship training. In the content of this report, I will present the production cycle of automotive cables in the company "SEBN-TN". I will try to make an industry 4.0 solution regarding an AGV automatic guided vehicle.

ABSTRAKT

Dieses Dokument ist die Zusammenfassung meiner Arbeit im Rahmen der Praktikumsausbildung. Im Inhalt dieses Berichts werde ich den Produktionszyklus von Automobilkabeln in der Firma "SEBN-TN" vorstellen. Ich werde versuchen, eine Industrie 4.0-Lösung für ein automatisch geführtes FTF-Fahrzeug zu entwickeln.

ملخص

هذه الوثيقة هي ملخص لعملي في إطار التدريب الداخلي. في محتوى هذا التقرير ، سأقدم دورة إنتاج كابلات السيارات في شركة "SEBN-TN". سأحاول تقديم حل صناعي 4.0 فيما يتعلق بمركبة موجهة أوتوماتيكية AGV.

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