# Minimum stock change based on the production capacity at Plastique Forme Romania

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*Summary*

*This paper has the purpose to change the minimum stock quantity at Plastique Forme Romania, in order to reduce the stock value.*

*Key words: logistics, stock, minimum stock reduction, production capacity*

## Introduction

The decision to change the minimum stock was made in after the inventory at the end of 2020. The total value of the stocks was almost 250.000€. I have included in documentation the table for the inventory regarding all the parts that were in stock at the end of last year.

The inventory was done in the ERP system PMI, and the data were exported from the program for other analyses.

We decided to change the minimum stock quantity, because starting February 1st, the company will switch from an old project/ where the value of the stocks was high (for reference products like as SFB613P), to a new project, where the products do not require the same amount of time to be achieved.

In the calculation of the value of the final stock were included not only the products, but also the other materials required to do the final kit/products which the client pays for. As the value of the stocks was bigger than that of the gross revenues the company targets every month, we had a red flag, and decided to do some corrective actions.

We do not keep stocks for finished goods, so all the stocks were for raw materials, WIP (work in progress-semifinished goods) and other components**.**

## Methodology / Approach

For an easier understanding of the process, I selected 8 references for an analysis. Four references are from an old project that was reduced from February and where we had big stocks in December, and the other four are from a new project that started at the beginning of 2021 and where we have big orders now. All the references selected form together a kit that is sold as a unit. So for a kit is needed one part SFB(glued with tape) from every reference listed.

| REFERENCE | QUANTITY | PRICE/UNIT | | TOTAL VALUE |
|---|---|---|---|---|
| SFI426L | 600 | 1.12 | € | 672.0 |
| SFB426L | 1998 | 1.75 | € | 3,496.5 |
| SFB426P | 1180 | 5.25 | € | 6,195.0 |
| SFI426P | 900 | 3.61 | € | 3,249.0 |
| SFI613P | 720 | 3.75 | € | 2,700.0 |
| SFB613P | 1558 | 5.08 | € | 7,914.6 |
| SFI613L | 2400 | 1.12 | € | 2,688.0 |
| SFB613L | 1737 | 1.69 | € | 2,935.5 |

Table 1.1. Stock at 31.12.2020 for references of the old project

I took into consideration the part from injection SFI and the parts ready for packing SFB. The total value of the stocks for them was around 30.000€.

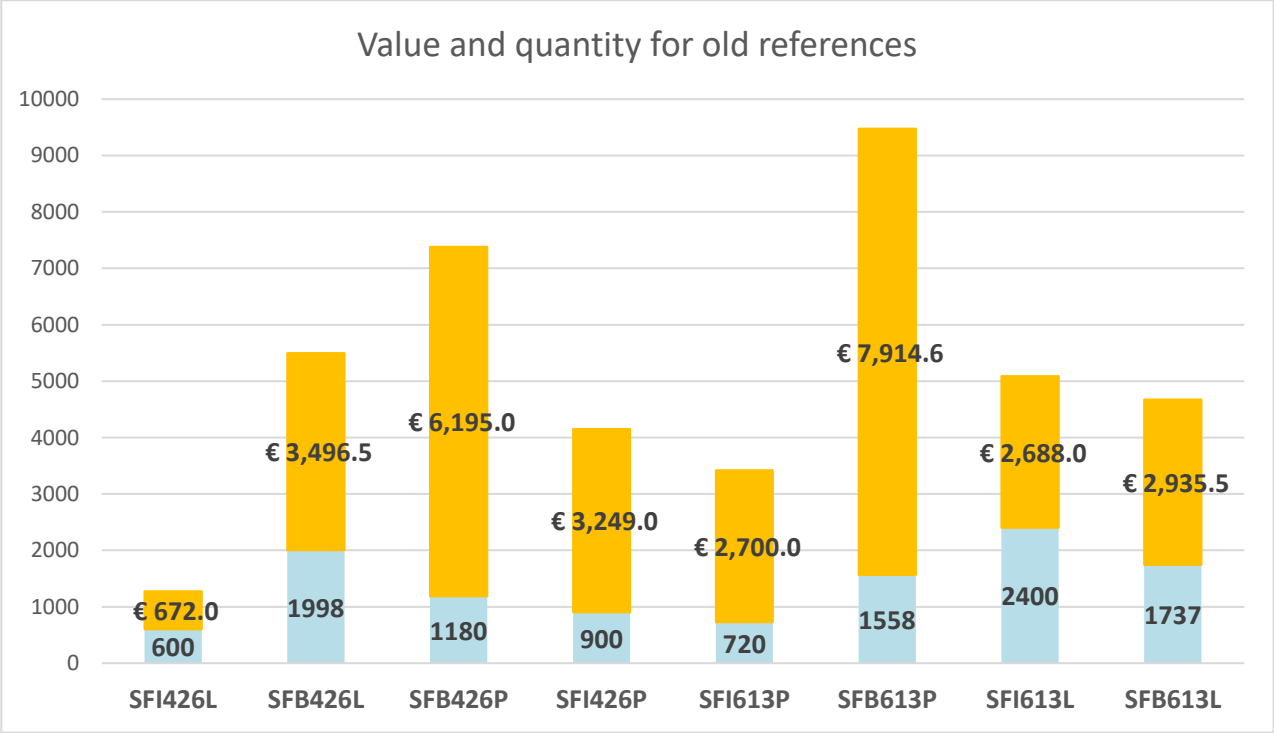


Fig. 1.2. Value and quantity for old references

| REFERENCE | QUANTITY | PRICE/UNIT | TOTAL VALUE |
|---|---|---|---|
| **SFI230A** | 1327 | 2.1 | € 2,786.7 |
| **SFB230A** | 37 | 3.77 | € 139.5 |
| **SFI230B** | 1335 | 2.1 | € 2,803.5 |
| **SFB230B** | 5 | 3.9 | € 19.5 |
| **SFI230C** | 2400 | 1.42 | € 3,408.0 |
| **SFB230C** | 20 | 2.48 | € 49.6 |
| **SFI230D** | 2400 | 1.42 | € 3,408.0 |
| **SFB230D** | 40 | 2.62 | € 104.8 |

Table 1.2. Stock for the new project at 31.12.20

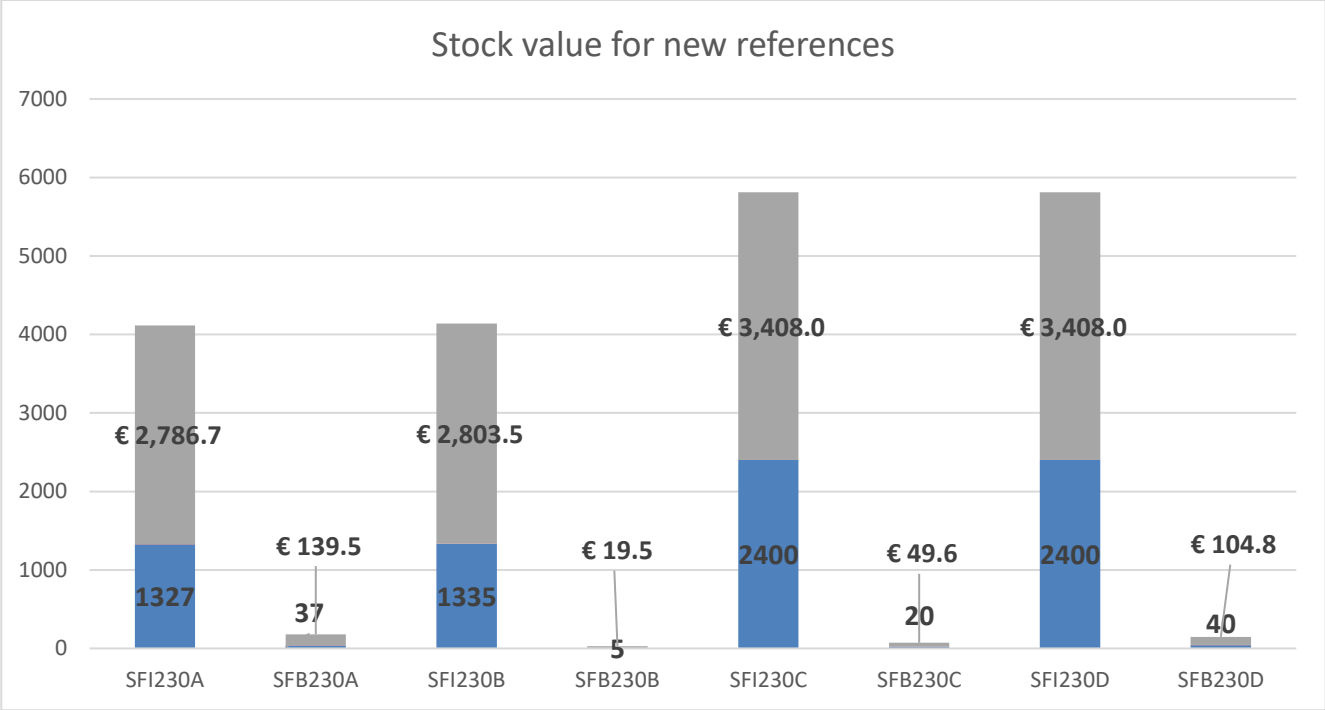


Fig 1.3. Stock value for new references

As the project was new and in December 2020, we had the first delivery we had a big stock for the SFI products, and a low SFB parts ready for packing. The total value for this reference is a little above 12.000€.

## Research (proper, description)

As a first step into the reduction of the minimum stock, we started in January and analyze where we wanted to learn the capacity of production of the company because there were some changes as automation changing of the malls changing of the machine injection and the time required to make some products changed. As for that we analyzed every product when it was in production. we were interested in the time cycle and if all the components where right written on the fabrication order. when we started our main priority was to find out the difference between the time cycle that we have in our system and the real one, because we had a bigger time, and we made the planning based on that time and because of that the planning was often postpone. It took us around two months to find out every product that we were interested in an after we had all the time an all the fabrication orders verified, we could make some decision one of that was to change the minimum stock based on the production time an based on our capacity, another one was too change the planning and to base it on the production time.

Starting with the production capacity we found out for the most important product and the most required ones what was the real time of the production for a box.

Depending on the product or on the type of boxes used we either stock the products as 150 parts per box or 300 parts per box.

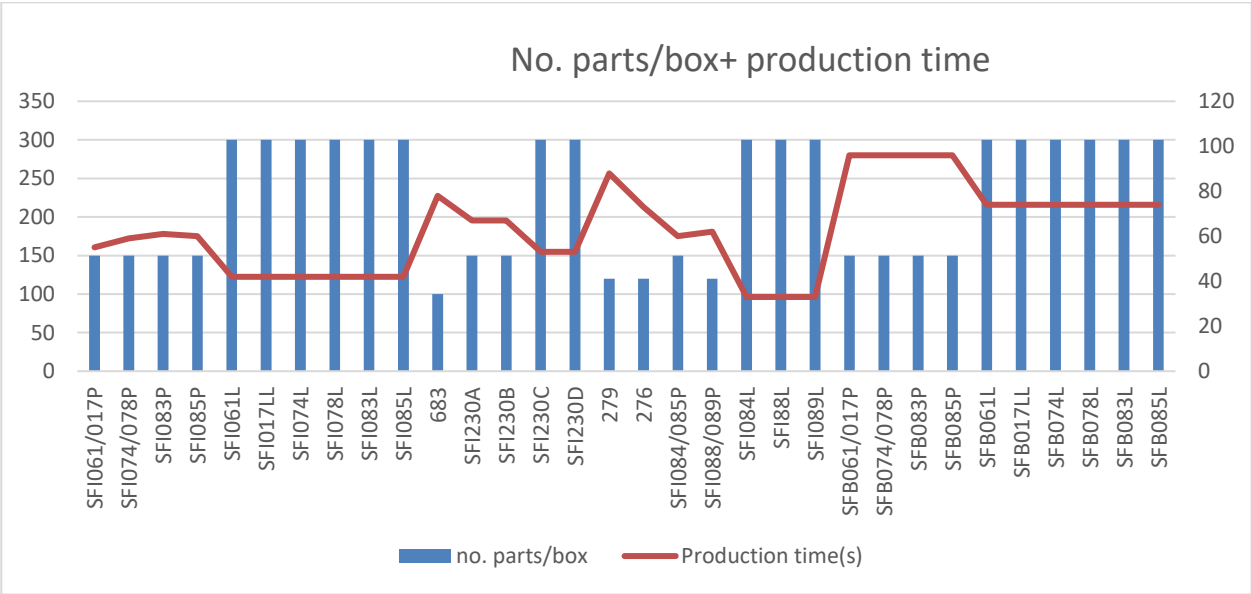


Fig. 1.4 . No. parts/box and the production time

As we can in the graphic for the products that are in the same category the palletizing it is quite constant Anne also the production time it is quite stable. The little difference we can observe is the flux fluctuation we are having when it comes to different types of products. But we can clearly see that after the

automatization the process is stable, in injection we still have some problems at the references 279/276/683 where the injection time is bigger. For 279/276 we are still working to improve the production time, but as for 683 it very much depends on the operators, because it's a product that works manually. For the SFB products it is the same, as they are made in the assembly area manually by the operators.

After we made this analyze on the production time and changed into the nomenclature, we could calculate the time needed to produce the eco quantity.

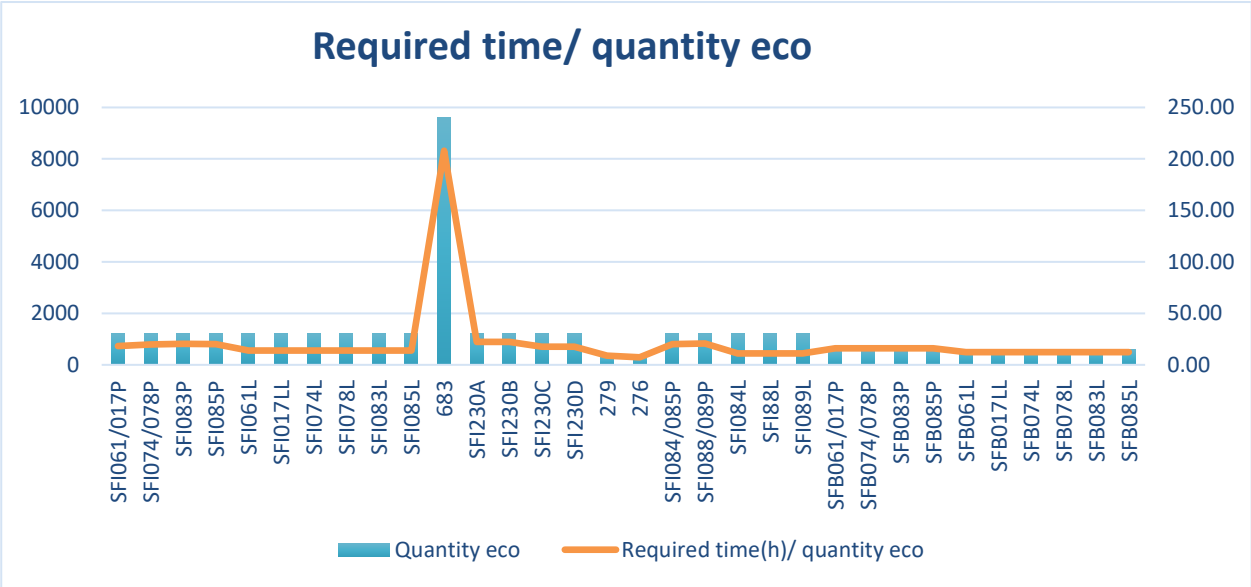


Fig. 1,5. Required time(h)/ quantity eco

As we can see the biggest problem is with the reference 683, where the minimum eco quantity is 9600, and the overall production time is over 200 hours. We were interested into transferring the eco quantity in production days, the first step was to modify the eco quantity for the products that exceed 14 hours (we are currently working in 2 shifts-16h so if we exclude the startup for the injection machine and the non-productive times, we still have 14 working hours in a time). So, we wanted to convey all the eco quantity into one working day.

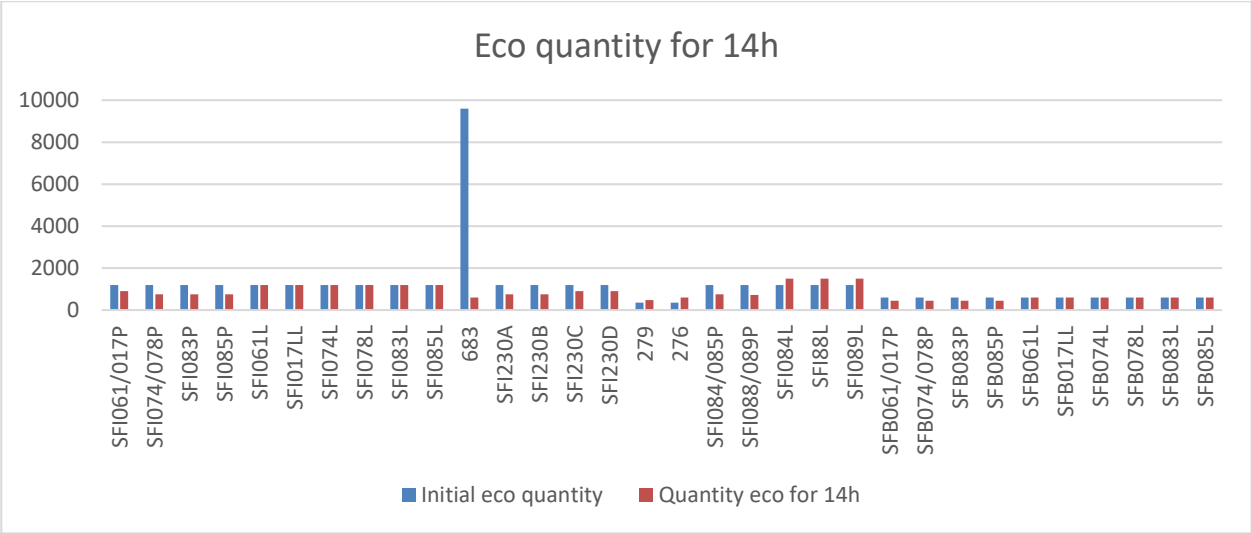


Fig. 1.6. Eco quantity for 14h

As we can see in the graphic above, in some cases we can product more than the quantity we had set as eco before, in some cases we are capable of producing the same quantity, and in some cases, we can produce less than the quantity set as eco. For the products where we can produce more and equal with the same quantity before we decided to reduce the quantity to 7-8 working hours (depends on the time needed to complete a box), and for the products where we can produce less that the quantity set before we decided to set the minimum eco quantity as one working day.

Excluding the product referred as 683, where the minimum quantity will be set with the quantity we are able to do in one working week. The quantity required for this product is bigger than the rest because is the water pump cover and it is used directly in montage at Dacia.

Now starting for the eco quantity that we set in production, we can further determinate the minimum stock by production capacity.

As for that we concluded that we do not need to keep a minimum stock for the parts from the old projects as we can make them in 1- 1 and a half day (usually the orders are quite small).

Also, we decided to keep a small minimum stock for SFB (the products used in assembly line have an expiration date after being used) and a bigger stock for SFI.

The minimum stock was decided to be the same as the eco quantity for the injection process.

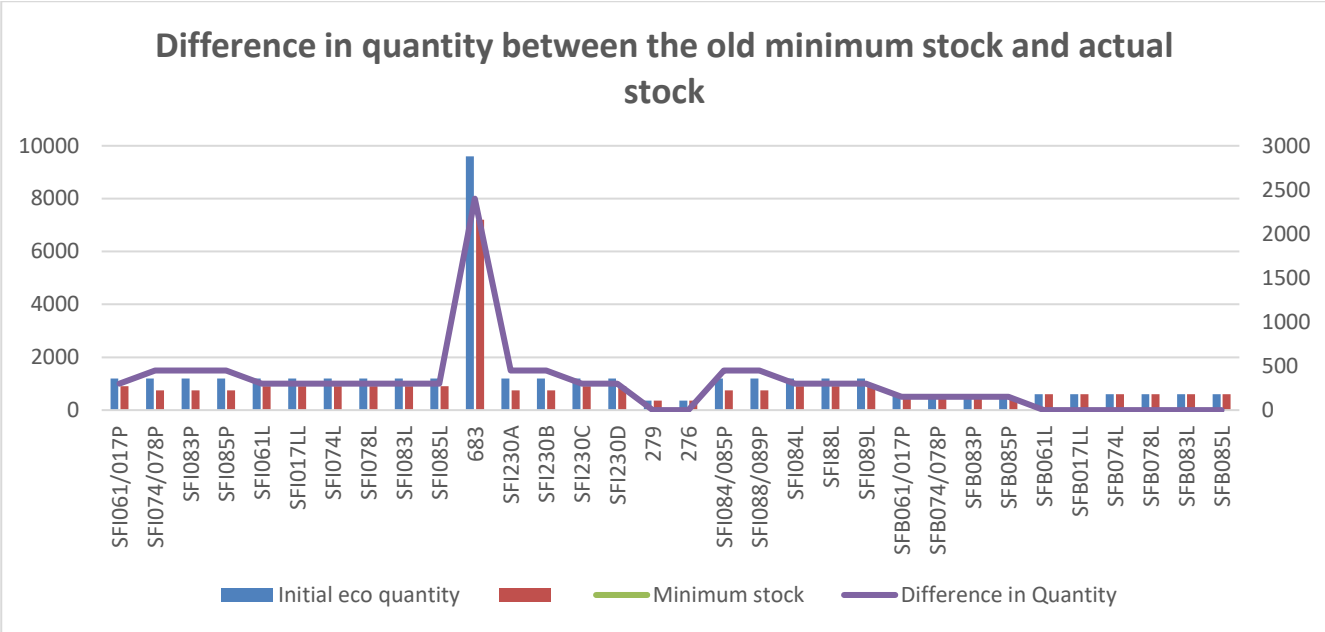


Fig. 1.7. Difference in quantity between the old minimum stock and actual stock

We can see in the graphic above the difference in quantity regarding the old minimum stock and the actual minumum stock. As per some references the difference in quantity is quite small for most of the references, under 500, and for some references where the eco quantity was the same as the minimum stock before, we can say

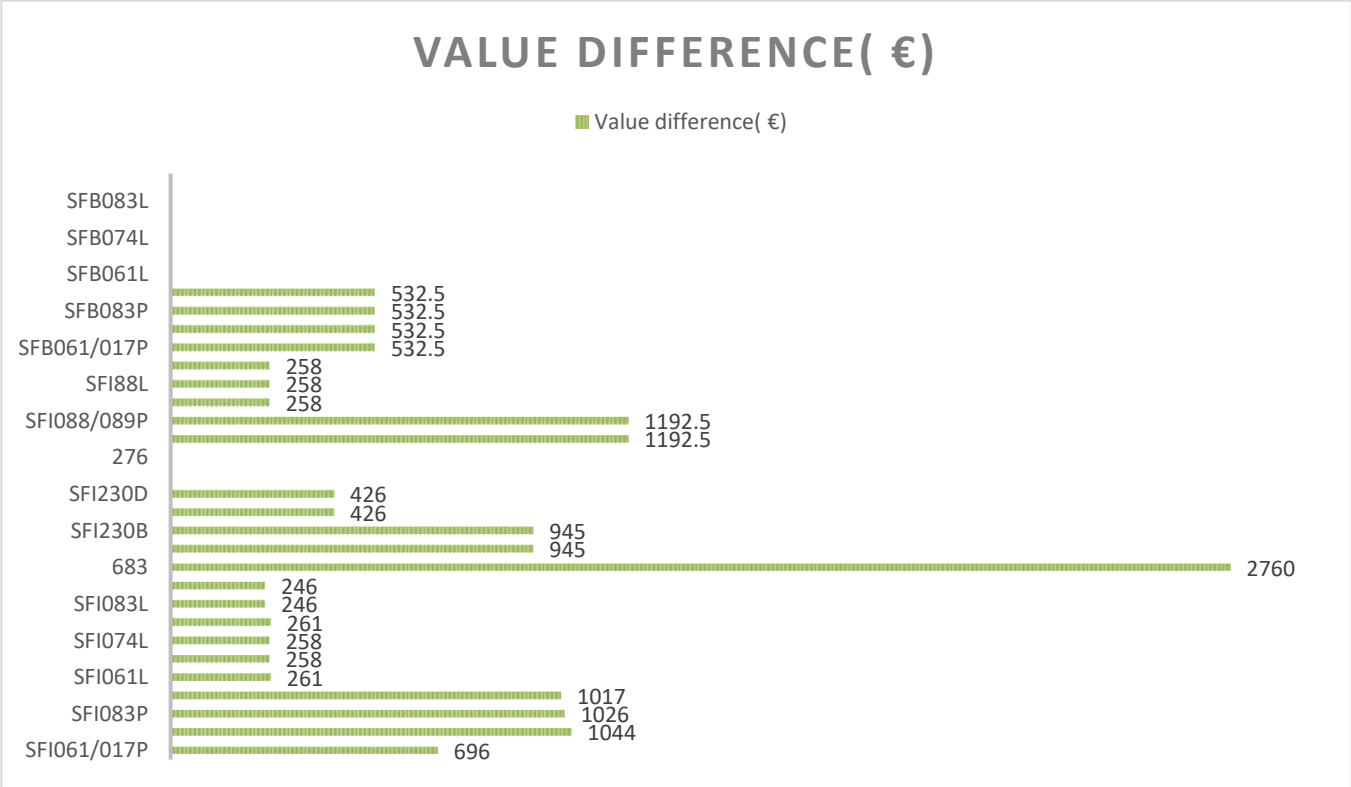


Fig 1.8. Value difference

The difference between the old eco quantity and the new quantity may not differ very much as per quantity, but with the set up that we implemented we reduced the value of the stock by over 16.000 euros. Not to say that we also reduced the nonproductive time by a little, let take an easy example, before when we did not make the planning in production time but in quantity, if the production stopped before with 2 hours before the closing time, the setter will only assemble the mold but will not start the production, as now we calculate the production to end at the time of closing we reduced that unproductive time.

Also as we can see in the inventory from march 2021, where we eliminated the stocks from the old projects we can see that we reduced the value of stocks to a little over 80.000 euros(for the semifinished goods), the overall decrease for all stocks was from 250.000 euros to 200.000 euro, an 20% decrease.

The situation from which we start is a list-type planning displayed on the board at the entrance to the production section. This planning is divided into 3 categories: the related planning for the injection machines, the related planning for gluing tape (assembly), the last category being packaging.

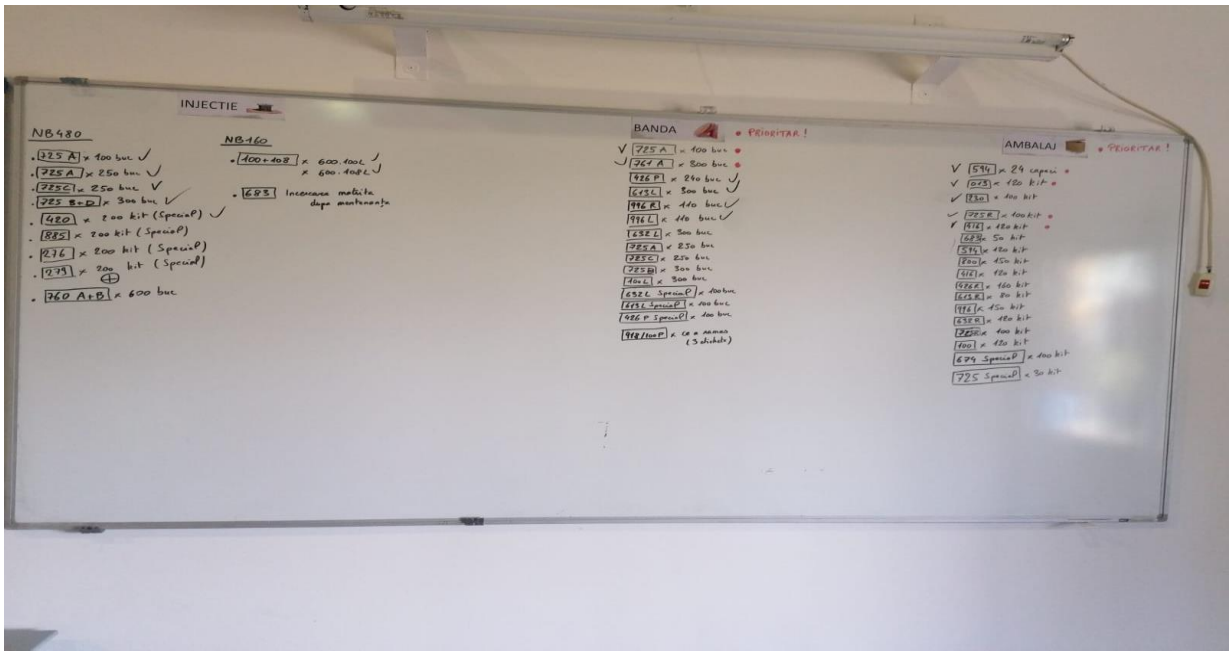


Fig 1.9. Old planning

- Planning could only be done for short periods of type;
- Only minor comments could be added without charging a lot;
- They were not marked with the sign of completion of certain orders, so in some cases double quantities were made;
- If the products were not produced in the order set out on the original board, there were cases where certain products were not made.
- Very busy appearance and the production schedule was somewhere at 1h.

It was therefore desired to automate the production planning for which two variants were proposed and tested:

Variant 1. List planning

For the first option we kept the idea of the list. The application was written and developed in MySQL.

So, keeping the idea pf the list we have 8 columns. The first column is represented by the new OF generated by the system that are not allocated for a post. The next five columns are represented by the injection machines, the next one is for assembly and the last one is for packing.

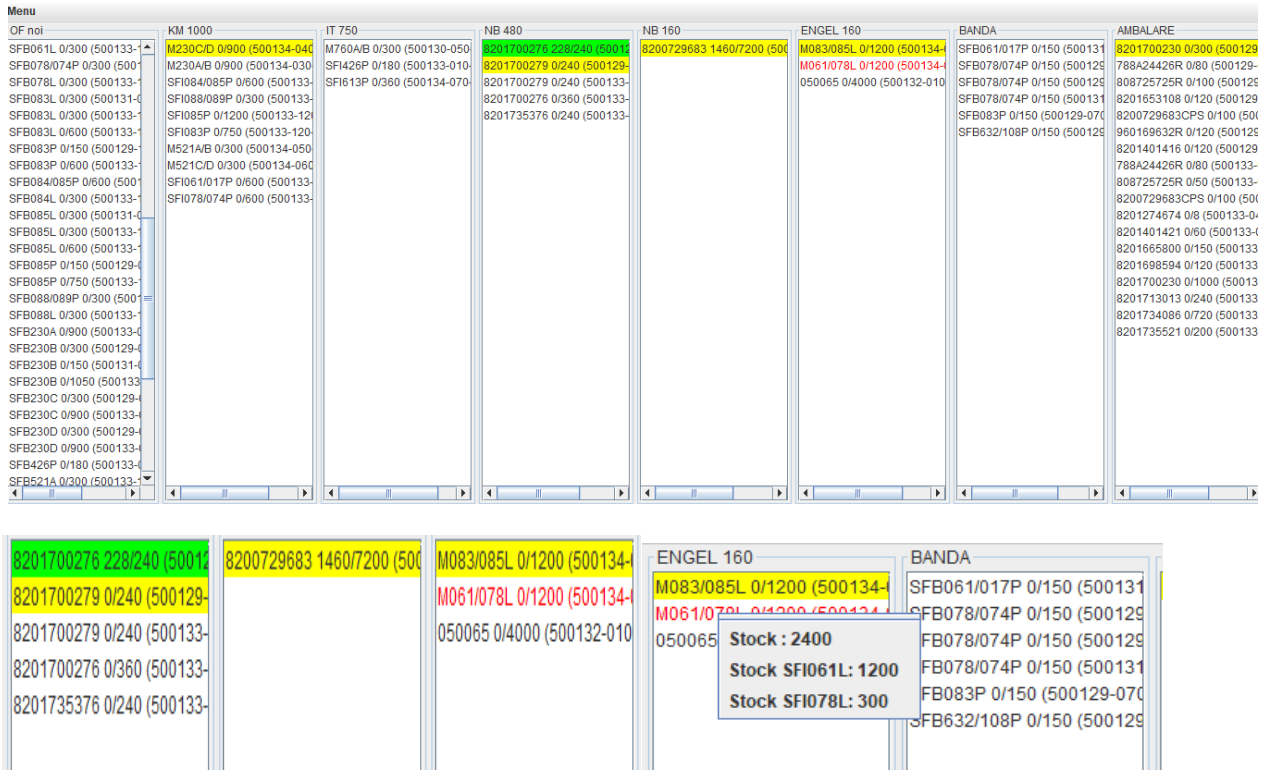


Fig. 1.10. List planning

The planning has a few features. The first one is that we can change the color for the OF if it's finished but undeclared in the ERP system, yellow in production, and with red it's signal us that the of has some comments. The comments do not have limits in characters and a new tab is open to write/read them. We can see the clocking of the operators in real time (no. of parts done from the of ex. 8201700276 228 parts/240 parts). In the menu we also find a button of refresh, to update the planning after some OF are generated or declared in production (the generated Of's appear in the list ~NEW OFF~ and the declared Ofs disappear from the list).Another useful thing that the application is capable of, is that we can check the stock in real time for the references in production, as for that is more easy to plan everything for every post, taking in calculation what we decide to deliver weekly. We are currently using this app.

2. Application 2 GANTT

The planning application is directly linked to the ERP (enterprise resource planning) system data base. So, all the OF (Fabrication order) created and updated in the ERP are also find in the application. The OF are separated by the type of process which is also extracted from the ERP. In the menu, the non-affected OF can be found. To add the OF to the planning, it is necessary to simply make a left click on the OF.

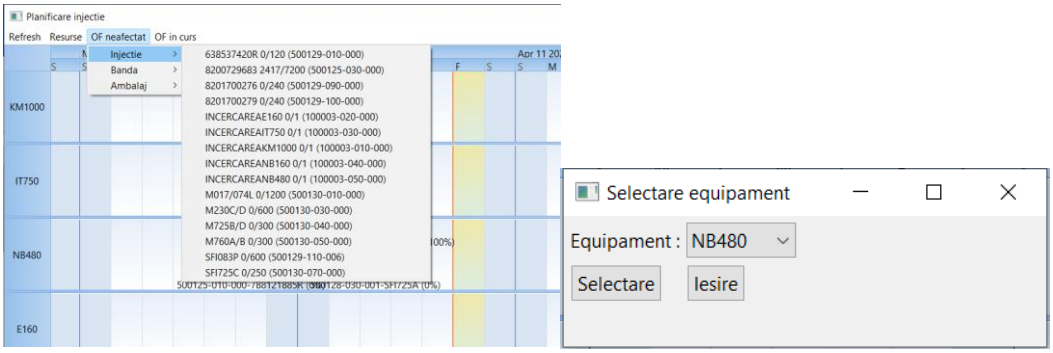


Fig. 1.11. Insert OF in Gantt planning

For the injection OF there is another step which consist of selecting in which equipment we want to plan to OF.The OF are added to the planning following the rules: if the end of the last OF planned is before the time of the adding, the start time of the OF is the time of the adding. If the end of the last OF planned is after the time of the adding, the start time of the OF is the end time of the last planned OF.The end time of one OF is calculated base on the start time plus the standard time for producing this OF divided by the number of operator working on the equipment which is a modificable parameter. If the OF is extending during non working hour (parameters) the end of the OF is move further in time to compensate the non-working hour.It is possible to move the OF, after to have it planned, by a simple drag and drop where it is desired. After the drop, the OFs which are after the OF drop (in case of moving in a previous time) or the OFs after the drag (in case of moving in a futur time) are moved in order to not let any free time between them. If an OF is closed in the ERP it is not possible to move it anymore in the planning app.The start of an OF can be forced by making a right click and selecting the date and hour of the start.

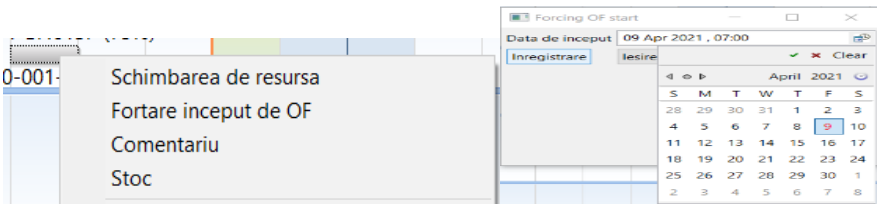


Fig. 1.12. Posible actions in app

If case there is a new equipment in the factory, it is possible to add it via the menu and selecting the type of the equipment. It is also possible to desactivate one equipment.

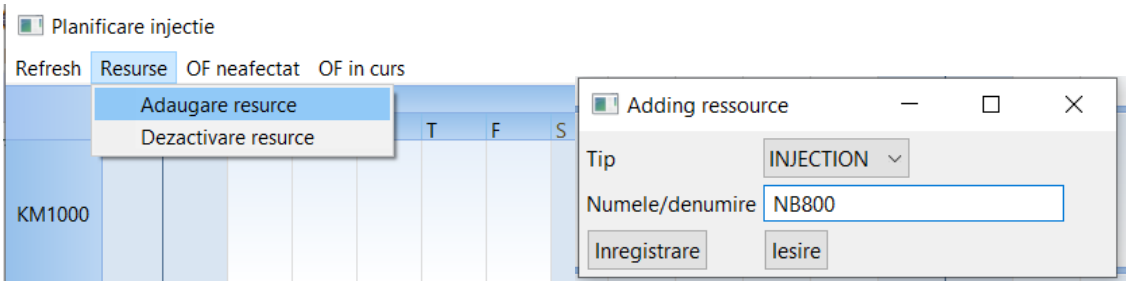


Fig. 1.13. Adding new equipment

The realisation status of the OF is automatically updated taking in consideration the quantity produced versus the ordered quantity. The color of the OF is also changing based on the status of the OF (grey: normal status, yellow: OF in production, green: quantity produced=quantity ordered, blue: OF closed). It is possible to zoom in and out to have a global view or a move detailled one.

Fig. 1.14. Detailled and global view

By making a right click of one OF, the alocated equipment can be changed, a coment can be added or modified. The stock of the produce can be access and also the stock of the internals components necessary to produce this part. If the stock of the composant is not enough to produce the OF, the background color of the component stock is red.

## Results and limitations of research

As we can see in the inventory at the end of March beginning of May the stock value improve. without this we took into consideration the semi fabricated goods and we have a value off a little bit over 80.000. if we take in consideration all the other products like row material the total value of the stock it is a little bit over 100.000. we can see a little bit of improvement as the value from the old products and projects had a decrease, but we can also see that the knew that there was an increase for the products from the new projects.

For the old projects, the value before was around 30.000€ and now we have a value around 5.000€.Only for this part we had a big improvement for the stock value. We have a decrease of 83.33%.And as the orders from this specific product started to decrease as well, we plan to lower the stocks even more. We plan to not have more than 300 parts for every reference listed.

For the new references, the decrease was a little lower. In December the value of the stock was around 12.000€ and at the beginning of May it was around 9000€. We had a decrease of 25%. As this project grew quite well, we can lower anymore than this the minimum stock, as by the time when the inventory was done, we had in firm order 1350 kits to deliver until 14.05.2021.

## Originality of the work

This paper is unique because it was made based on the information and data I have colected from my workplace. Under the supervesion of my boss , the production director Guillaume Sie, I was in charge of this project, and in the period January 2021-May 2021, I started to make all the analysis on the process to find all the information required for this paper.7

## Conclusions

The overall difference in the stock value before implementing the new minimum stock and after, is around 50.000 euros, so we can conclude that we had a decrease in stock value of almost 20%.

As the implementation will take a little time, we are still in the testing period. We started the project at the beginning of the year, it took us 2 months to analyze the process, one month to calculate the production capacity and to calculate the new minimum stock, so the final implementation was around april 2021, so at the time being we are still trying to lower the stock for the old references where we had stocks that we did not need.

After the analysis, we have concluded that the best is to keep a very low stock for the products where the orders are little and with a reduced frequency, and to rise the stock for the new parts where the orders grown, or in some cases to reduce them by a little.For the old projects, the decrease was around 83%, and for the new projects, the decrease was around 25%.

We also implemented a new planning, starting from the planning written on a board to an automatized planning. Right now, we are using the first solution proposed, the list planning, the Gantt planning is still under tests.

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