

POLITECNICO DI TORINO

Corso di Laurea Magistrale in Engineering & Management

Tesi di Laurea Magistrale

Creation and Implementation of Real Time Quality Software to increase the statistical study linking the Production and Quality



Business Tutor

Ing. Davide D'Amore

Academic Tutor

Ing. Raffaella Sesana

Done by
Sridhar Rathinasamy (s252611)





1. Introduction

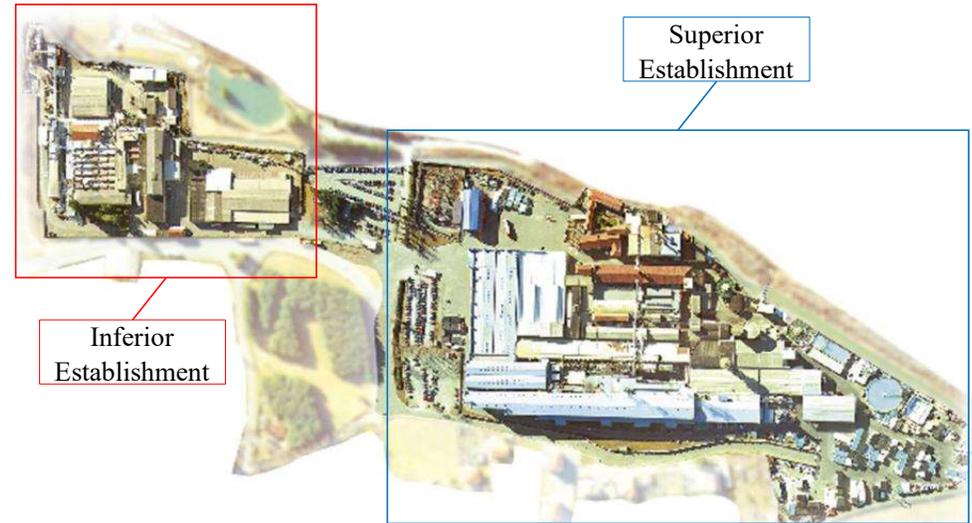
- Ahlstrom was founded by Antti Ahlstrom in the year 1851 in Finland and Munksjö was founded by Janne Lundström & Lars Johan Hierta in the year 1862 in Sweden.
- The company Ahlstrom & Munksjö merged together in the year 2017 and it forms Ahlstrom – Munksjö.
- A-M is one of the Europe's most innovative paper producer and It was delivering first class products to the worldwide customer.
- Ahlstrom – Munksjö is a global company, that produces fibre-based products. More than 90% of products are made from renewable fibres.



Business Sectors

Some of the few business sectors are

1. Décor
2. Filtration & Performance
3. Industrial Solutions
4. North America Speciality Solutions.
5. Specialities.



Production Process



The Production Process are divided into five steps. Namely,

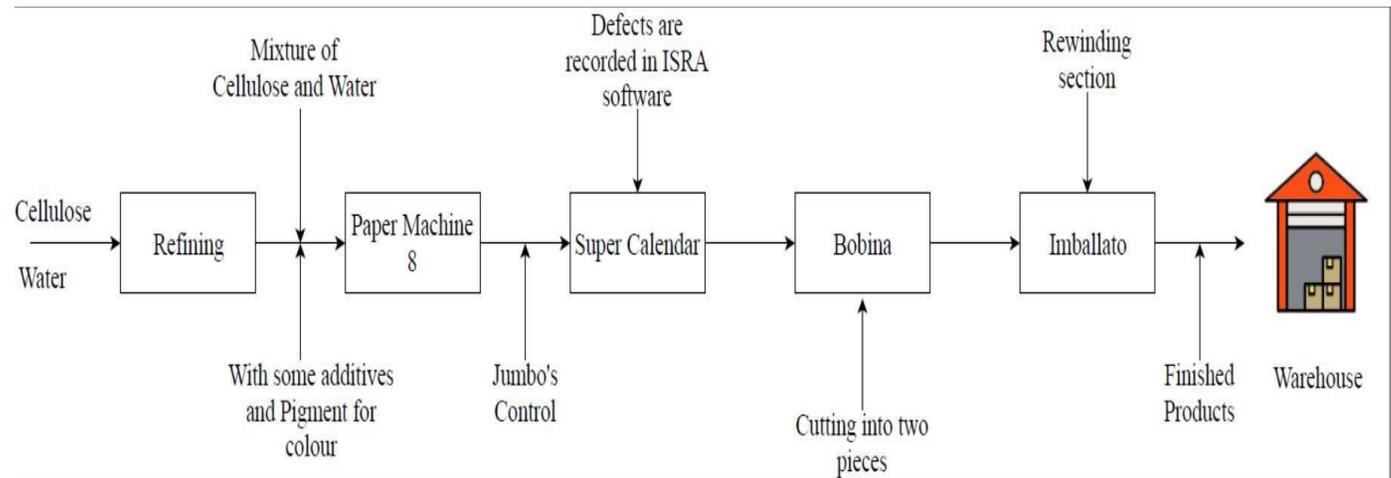
1. Refining & Coating Kitchen Section

2. Paper Machine 8

3. Super Calendaring

4. Cutting Section

5. Packaging Section





2. Objective

- To understand the production process in the Paper Machine, Super Calendars (Kelinwefers & Voith Sulzer), and in the Rewinding system, and to create the Real Time Quality Software to minimize the process of identifying the defects.
- The main motto of this project is to create an automation of the Real Time Quality software, and a simple user interface in order to use this software program to identify different defects classes in the ISRA Software database, which is scanned during the production of paper.
- The actual system is used to check the quality of paper created by the external company in a closed database, and the production and quality department cannot customize the Statistical Quality Control Process.
- So, with the help of this Real Time Quality software, the company wants to read the database and to create a helpful platform in order to increase the statistical study linking the Production and Quality.



General description about ISRA Software in the Paper Machine, Super Calendar and Vari – Roll

- The main function of ISRA vision software is to identify the defects on the paper.

The functions of each ISRA cameras are totally different, and the Specifications are as follows,

1. The ISRA VISION Camera in Paper Machine 8 and Kleinwefer are used only for Transmission purpose.
2. The ISRA VISION Camera in Voith Sulzer is used for both Transmission purpose as well as for Reflection purpose.



Identification of Defects on ISRA Software

- Based on the size of the defects, the software identifies the defects that are in the paper and allocate the defects under its category.

Based on the available information in the defects classifier options, If the defects are under ≥ 7 , it will automatically comes under Macchia Chiara Media.

Quick Teach	Class Name	Class Constraints
.....	Inizio	All Defect types: MD
.....	Micoroforo	All Defect types: Area AND
.....	Macch Chiara Micro	Bright Defects: Area
No Group	Buco Grande	All Defect types: Area AND
No Group	Buco Medio	All Defect types: Area AND
No Group	Buco Piccolo	All Defect types: Area AND
QT Match not found	Macch Chiara Grande	Bright Defects: Area
QT Match not found	Macch Chiara media	Bright Defects: Area
QT Match not found	Macch Chiara formaz	Bright Defects: Area
.....	Macch olio Grande	Bright Defects: Area
.....	Macch olio Media	Bright Defects: Area
.....	Macch olio Piccola	Bright Defects: Area
QT Match not found	Piega	All Defect types: Area
QT Match not found	Fibra Legno	All Defect types: Area AND Area
QT Match not found	Macch Nera formaz	All Defect types: Area
.....	Macch Nera formaz	All Defect types: Area AND Aspect Ratio
.....	Macch Nera formaz	All Defect types: Area AND Aspect Ratio
.....	Macch Nera formaz	All Defect types: Area AND Aspect Ratio
.....	Macch Nera formaz	All Defect types: Aspect Ratio
.....	Altro	All Defect types:

For Example,

Quick Teach: QT match not found

Class Name : Macchia Olio Grande

Class Constraints: Area $\geq 38\text{mm}^2$

Important factors to consider while producing paper



Important factors we have to consider while producing papers are,

1. Size
2. Frequency
3. Typology of defect.

We are manufacturing three different types of colour paper. They are,

1. White
2. Yellow
3. Yellow TS (Mixture of Yellow and Red).

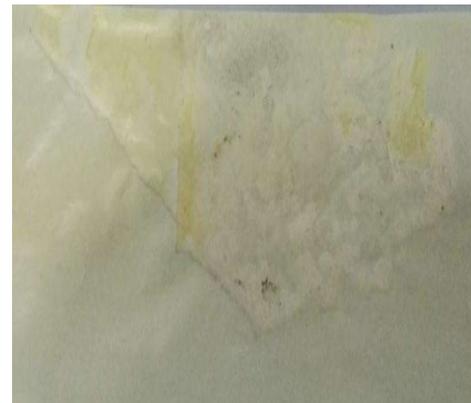
Types of Defects:

There are some defects which create difficulty to the next level. They are

1. Functional Defects
2. Visual Defects



Defect with Lines and stripes





3. Real Time Quality software

- The main use of this software is to extract the defects that are presented in the manufactured paper. The length of the paper that we are manufacturing in our plant is approximately 72,000 km and weight is around 20t.
- Previously, we collected all the jumbo rolls defect details as well as we pasted it on the sheet in a sequential order to check the defects on the release liner paper.
- In order to simplify the steps to identify the defects in the PM8, Super Calendars and the rewinding machines are fitted with ISRA Vision camera's with different specifications and set ups.
- The reason why we are going to implement Real Time Quality into our Paper Machine 8, Super Calendaring and in Rewinding Sections are, in order to make the production process ease and to improve the quality of the Production process.



List of features implemented on the Real Time Quality software

- After I had the discussion with the Production Department and the Quality Department, I came to conclude that what are the steps that are needed to include on the real time quality software.

The software is programmed with following features,

1. It has to retrieve defects from the ISRA database in real and stores the information in the separate database.
2. It shows the custom charts with real – time data, that focus on important trends for the quality department.

3. It has to monitor and the retrieved the values to send reports and warnings to the Production & Quality department if the defects are exceeding from the threshold.

4. It allows to export data to excel based on some filters.

The software has to collect the data from the following machines,

1. Paper Machine 8
2. Super calendars (VOITH & KWF)
3. Vari – Roll (B637)



Working of Real Time Quality Software (1)



- Using the ISRA cameras, we can able to identify the number of defects that are available on the jumbo rolls and total number of defects also we can able to identify on each jumbo roll.
- In order to identify the defects more precisely, we entered the specification limits of the defects using the defects classifier options in the ISRA vision software.
- In order to count the defects in the more efficient way, the automation of this software will help.
- It is not easy to count all the defects in the jumbo rolls manually and visually.



Working of Real Time Quality Software (2)



The main motto of this software is to extract the only the few important defects such as,

01. Inizio
02. Micorforo
03. Macch Chiara Micro
04. Buco Grande
05. Buco Medio
06. Buco Piccolo
07. Macch chiara grande
08. Macch olio grande
09. Macch olio media
10. Macch olio piccolo

- And with the help of CARELMIL software, the Real Time Quality Software has to arrange the sequential order of the finished jumbo rolls and it has to produce the output along with the help of ISRA database.
- As well as the real time quality software will calculate the defects based on defects per m² in the produced paper.



Working of Real Time Quality Software (3)

- After collecting all the defect types and its counts, the software can export these data into the excel file.
- Using that excel file, the production and the quality team based on the defects counts on each defects, it helps us to make it as a trend for various defects and help us to compare in terms of both production and quality as well as it helps us to compare the trends with the customer standards, and we can able to improve the quality of our products and we can able to minimize calculating the defects and obviously it's a time saving process when compared to the previous method of calculating the defects.



4. Automation for Real Time Quality Software

Start Date The start date from which to start examining ISRA's files. It must be written in the format YYYY-MM-DD (year-month-day).

End Date The date of the last day of which you want to examine ISRA's files. It must be also written in the format YYYY-MM-DD (year-month-day).

Ranges It represents the intervals in which to subdivide the areas for the calculation of defects by area. Each number that is written represents the values LESS AND EQUAL to the number.

For example, if 1 is the first number, it means that the first range take values for the areas between 0 and 1. Each number must be separated from the others by a semicolon. The last number does not require a semicolon. Area values higher than the last number are discarded; for example, if 1000 is the last number, area values greater than 1000 are discarded.

Filters It represents the types of defects that you want to take into consideration. If you want to combine several types of defects in a single filter, you must separate the names of the various defects with an ampersand (&).

For example, if you want to consider black spots and wood fiber together, the corresponding filter will be: **Black spots & Fiber**. Each filter you want to specify must be separated from the others by a semicolon.

Average length It represents the average length of the rolls examined; it must be specified because in some ISRA files the roll length is not specified. In this case, the average length specified here (in meters) is taken as the roll length. In some cases, the length of the jumbo would be variable because of the web break or with the different length because of the grammage of the paper.

```
#this is the first day (format: YYYY-MM-DD)
```

```
#this is the last day (format: YYYY-MM-DD)
```

```
#ranges definition
```

```
#separate each range with;  
For Example ranges = 1;6.25;10;20;1000
```

```
#filters  
#unify filters with & and separate with ;
```

```
#Example: "Macch near &Fibra; Macch chiara" means that you want unify results
```

```
# for "Macch nera" and "Fibra", and then you want also results for  
# "Macch chiara"
```

```
#if you specify just "Macch", the filter unify all  
# the faults that contains the word "Macch"
```

```
filters = Macch nera grande & Macch nera piccolo & Macch nera micro & Fibra;  
Macch chiara piccolo & Macch chiara media & Macch chiara grande &  
Traslucido & Macch olio; Micorforo; Altro
```

```
#average length of the reel
```

```
#this is used when it's not possible to extract the length of the current reel
```

```
average length = 65000
```

Program file

Simulation of the Program (1)



- In order to obtain the results, we have to open the Params file, Right click on it, when you right click on it, New dialog box will open.,
- Open → Params (right click on it) → New Dialog Box will open → Select Edit
- On the above dialog box, we have to enter the starting date and we have to enter the finishing date.
- Within that date, we have to add some filters options like the types of defects are available on the defect classifier options on the ISRA Software database. After saving everything manually in the software (Ctrl + S), we should run this automation software.



Simulation of the Program (2)

```
C:\\Users\\Desktop\\Paper_Machine8\\SuperCalander>rem net use \\141.127.51.30
C:\\Users\\Desktop\\Paper_Machine8\\SuperCalander>Java-Jar FaultTypeCalculator.jar \\141.127.51.30\\Wiscal\\Data
Loading Files...
    Exploring Day 2020-10-04...
    Exploring Day 2020-10-05...
    Exploring Day 2020-10-06...
    Exploring Day 2020-10-07...
    Exploring Day 2020-10-08...
    Exploring Day 2020-10-09...
    Exploring Day 2020-10-10...
    Exploring Day 2020-10-11...
    Exploring Day 2020-10-12...
    Exploring Day 2020-10-13...
    Exploring Day 2020-10-14...
    Exploring Day 2020-10-15...
    Exploring Day 2020-10-16...
```

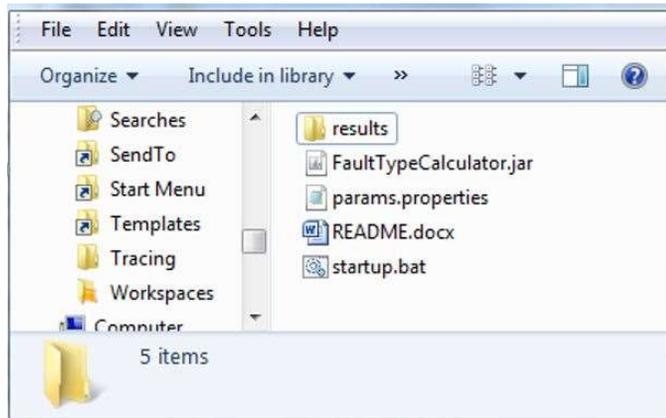
While running the Automation program, the software collects the data from the Ahlstrom-Munksjo's server from the start date to the End date that we mentioned it on the Notepad. Then the program starts to explore the Ahlstrom-Munksjo's database on that IP address, and it starts to analyses all the days that we requested in between the Start and the End Date.





5. Output/Results (1)

After running the software, the it will collect the data from the server of Ahlstrom – Munksjo and displays the results like this,



- All the defects are displayed in a separated excel (Macch Nera Grande, Macch Nera Grande, Macch olio Grande) and along with that, the simulation produces the compilation of all defects in a single file as Final Report.

	A	B	C	D	E	F	G
1	Start date:;"2020-10-04";,,,,	Column1	_1	_2	_3	_4	_5
2	End date:;"2020-10-27";,,,,						
3	Total area: →	73976541.94	,,,,				
4	,,,,						
5	DIFETTI/1000m2:,,,,						
6	filter name \ range	1	6,25	10	20	1000	,,,,
7	Macch nera grande&Macch nera piccola&Macch nera micro&Fibra	23251	4,8106	1428	72	222	
8	Macch chiara piccola&Macch chiara media&Macch chiara grande&Traslucido&Macch olio	28	0,6522	716	205	11	
9	Micorforo	8636	0,2013	0	0	0	,,,,
10	Altro	0	0	0	0	0	,,,,

There we can check the defects details such as No. of Defects on the Particular jumbos, etc.,



6. Conclusion (1)

- By using this Real Time Quality Software,
 1. We can able to minimize the time consumption for finding the defects details.
 2. We can Improve the Production Process Efficiently.
 3. We can improve the Quality of the paper by identifying the defects more precisely.
 4. It helps the Production and Quality Department to focus more on the production process.
- Real Time Quality Software helps the Production & Quality department to focus on creating more values through analysis.
- it can help us to identify a Quality deviation and can help us reducing the time needed to create a trends, and we are dedicating more time to find a solution in case of deviation.
- So, this Real Time Quality Software helps us to focus on the Real problem and not losing time to organize data.

Conclusion (2)



Future Implementations:

we have some plans to add extra features on this Real Time Quality Software such as,

- Adding the filters to separate the defects on the jumbo rolls
- To display the live update of Production status on Dry and Wet End Control Rooms, Daily Meeting Rooms, Super Calendar Sections as well as in Rewinding Sections like MS office presentations, etc.,