

Implementation of a Quality Diagnosis and Developing a Database for Dyeing Problems

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Abstract: Technology, material, human involvement, proper database & effective manuals of working procedures are relevant for the quality checking of colored fabric are essential for a dye house. The inseparable satisfactory of the dyeing method is the primary concern to dye the fabric through ensuring proper quality, because the last outcome of this produced fabric are the consumers who would purchase it to fulfill his or her personal needs. Just about the corporations have an exceptional service with a purpose to permit to obtain, display and hold pleasant in all sectors and circulate toward inner and outside procedures manipulation. The client is then long term end user of the prohibit product but all the business enterprise's services and the intermediaries are extremely important. Inside the following paintings it is tried to simulate a diagnostic nice in an agency facts, expand a quality tracking device through a database and then attempt to solve the

1. Introduction

A dye house entails the human, technology, machine and material. The inseparable quality of the dyeing process is the primary anxiety of the dyer, as the ultimate judge of this quality is the customer. Companies have a quality service that will allow to obtain, monitor and maintain the quality in all sectors and move towards total control of inherent and exterior processes.[1] The customer is then longer just consumers of the end product but all the company's services and the intermediaries.

In this research it is tried to create a diagnostic quality in a company data, develop a quality monitoring tool through a database and then give effort to solve the problems for obtaining the 3 ultimate goals of the company as "profitability, competitiveness, and the extension"[2].

The validity of this research is to analysis about effective software to identify & proceed for the rectification of faults of post dyed fabric from

problems to gain the three closing motto of the company as "profitability, competitiveness, and the extension".inside the method to any problem is to define a method to observe, it takes to adopt adroit path to achieve the desired consequences .The approach followed for the hassle is to stumble on abnormalities; have an effect on the performance of a given corporation and try to solve it through several approach which includes database that enables to screen pleasantly. Then need attempt to adopt a collaborative brainstorming with leaders of the business enterprise to try and optimize all enterprise manufacturing cost and this reducing the unnecessary expenses. As a satisfied employee is an effective worker, it's far sensible to say that satisfied consumer equals a hit business.

Key word: Database, quality diagnosis, dyeing problem, Pareto chart.

coloration fabric. For this purposes the right & accurate data could be assigned for the best & proper support from this software. Lots of factors are dependent for the coloration faults starting from the dyeing & dosing machines to finishing machines along with the negligence's of responsible authorities & management as well as concerned manpower for designated task like coloration & finishing[3, 4].

The typical value of concerned dyeing related parameters & procedures should be taken into account for the proper evaluation of the dyeing faults & to rectify them. So if the Database is formed properly for every types of dyeing faults after finishing the fabric & if after keeping them into account to proceed for further auctioning & if all the data is stored properly then these would be helpful to ensure a standard database. For these objectives various types of computer aided software are available along with the manual systems are practically implemented in the production floor. For ensuring proper quality measurement of the dyed

fabric various systems like 4 point & 10 point systems are available internationally [5, 6].

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2. Methods and analysis

2.1. Internal diagnosis

1. Diagnosis Human Resources: Presentation of the quality services effective

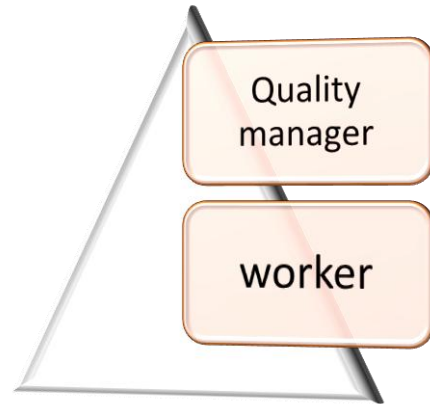


Figure 1: Quality Service Organization Chart

Table 1. Determination of absenteeism

Service Manager	Monitoring by workers
Worker 1	Raw material control
Worker 2	Raw material control
Worker 3	process control
Worker 4	process control
Worker 5	process control
Worker 6	Final test
Worker 7	Final test
Worker 8	Final test
Worker 9	Final test
Worker 10	Final test
Worker 11	Final test
Worker 12	Final test

$$\text{Rate of absenteeism} = \frac{\text{Duration of absenteeism (h)} \times 100}{\text{Working hour per week}}$$

$$\frac{\text{Duration of absenteeism} \times 100}{8 \times 6 \times \text{number of worker}}$$

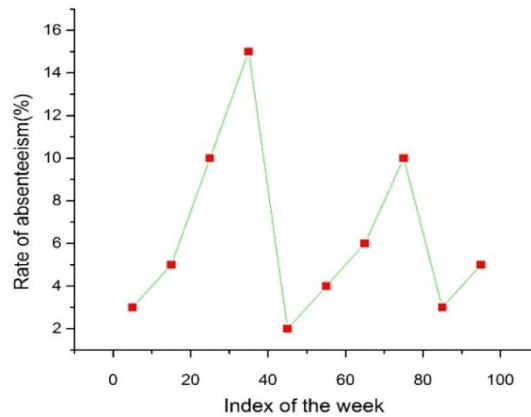


Figure 2. Rate of absenteeism per week.

From the curve of evolution of absenteeism, we note that this reaches maximum rates for the fourth and ninth week, double weeks before the pay week. This can be explained by the lack of an important system to motivate workers.[7] This absenteeism hinder the path quality control and efficiency of this service as "control" is a delicate operation and requires the presence of the entire team.

✓ **Supervision ratios Determination :**

$$\text{Supervision ratio} = \frac{\text{No of responsible manager} * 100}{\text{Service efficiency}}$$

$$= \frac{1 * 100}{13}$$

$$= 7.7\%$$

The supervision rate for this service is acceptable.

✓ **workers Education level**

Table 2. Education level

	Qualification	Experience
Service Manager	senior technician	5 years
Worker 1	any	2 years
Worker 2	any	2 years
Worker 3	any	4years
Worker 4	any	6 years
Worker 5	any	10 years
Worker 6	any	13 years
Worker 7	any	2 years
Worker 8	any	7 years
Worker 9	any	1 years
Worker 10	any	3 years
Worker 11	any	5 years
Worker 12	any	7 years

On remark that in the dyeing field employer possess lack of training. In terms of most of the workers experience have limited experience which give devastating effect on quality control as a controller must know the types of defects that can be presented and should be capable to visual detection which depends largely on their experiences[8].

✓ **The means of motivation adopted :**

No way of reasoning adopted by the company to motivate its staff.

2. Diagnostic quality

✓ quality control types tailored

The company adopts three types of control:

Raw material control: Raw material should be control carefully to avoid next generation problem. Current control: this control is done during the dyeing by comparing specific time with the standard sent by the client. Final inspection: it is a 100% final inspection

where the entire quantity is controlled before providing to .[9]

✓ **The control effectiveness:**

To judge the effectiveness of services is determining the ratio between the cost and the detection COQ:

$$\text{COQ} = \text{CP} + \text{Caint} + \text{CAext} + \text{CD}$$

CP: cost of prevention

CD: detection cost

Caint: cost of internal defects

CAext: cost of external abnormalities

▪ Detection cost

CD = cost + tests Salaries direct hand work + salary responsible

$$\text{CD} = 500 + (12 \times 600 + 900) \times 13 = 110300$$

▪ Cost of prevention

CP = cost + costs of training improvement

$$\frac{CD}{COQ} \times 100 = \frac{110300}{361300} \times 100 = 30.52\%$$

CP=1400+8000=9400

$$\frac{A_{int}}{COQ} \times 100 = \frac{200000}{361300} \times 100 = 55.35\%$$

- Cost of external abnormalities

CA_{ext} = + avoires the late delivery

Detection cost presents 30% of cost of obtaining quality as to the costs of internal anomalies; they reached 55% of total cost. After that consider this inefficient service but there is still a margin to invest in this service.

CA_{ext}=40000+1600=41600

- Cost of internal defects

C_{aint} = cost + cost of parts declassified materials cost + correction

✓ The consistent quality control

C_{aint} = 200000 DT

Based on the quality control followed we grouped the quantities of parts by defect type observed at prime place and then by machine and by last second dyes. These results are presented using Pareto chart for identifying the major fault.

COQ = 200 000 + 41600 + 9400 + 110300 = 361300

DT

$$\frac{COQ}{CA} \times 100 = \frac{361300}{1000000} = 36\%$$

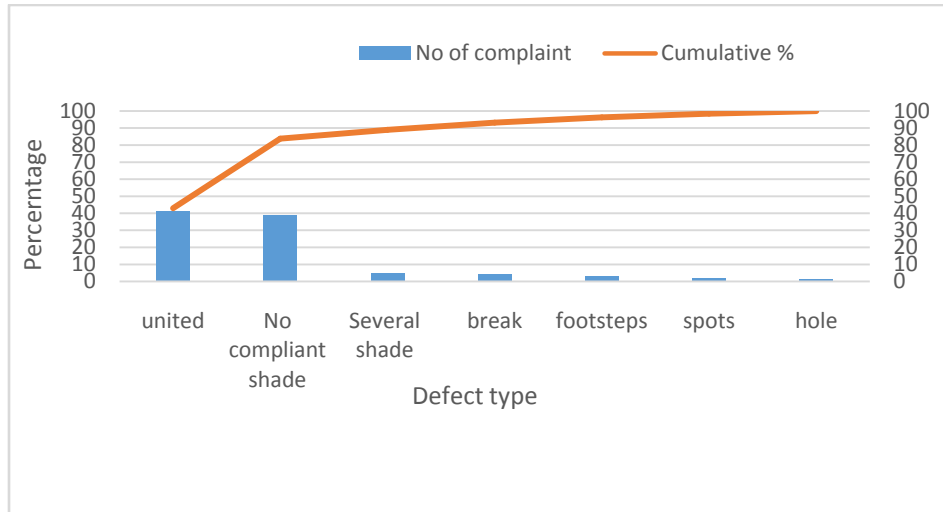


Figure 3. PARETO diagram for dyeing defects

On remark that both evil defects united and non-compliant shade represents more than eighty percent of quality problems. So to improve the quality within the company, we had to focus attention on these two defects pointing fingers about their causes to find the optimal solutions. The following chart shows the percentages of the problems detected dyeing machine

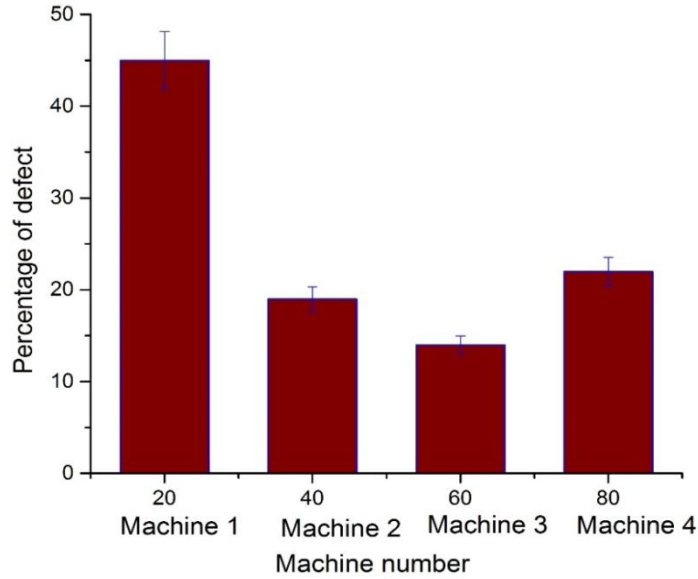


Figure 4. Percentages of the problems detected dyeing machine

The following diagram represents a sort of percentages of dyeing problems detected by color family

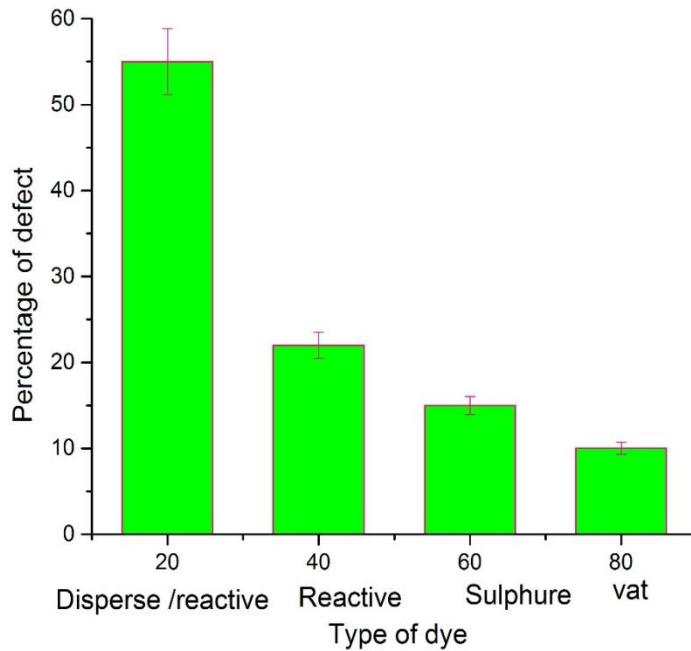


Figure 5. Frequency of defects by dye

Based on this diagram the major colorants which cause dyeing problems are mainly mixtures of dispersed / reactive. To identify the types of dyes responsible for two major dyeing problems (badly united and non-compliance) have percentages represents parts of each defect apart depending on the colorant.

Failure to unincorporated:

$$\text{Unincorporated percentage} = \frac{\text{Quantity of bad part unit (colorant X)}}{\text{Quantity of total bad part unit}}$$

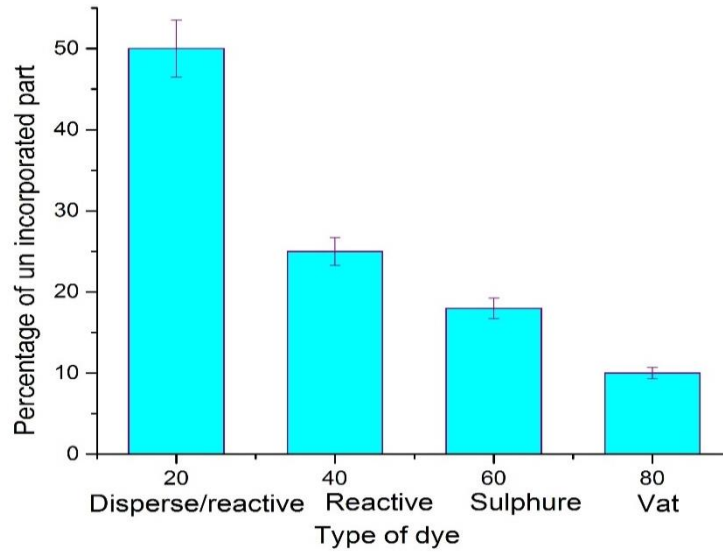


Figure 6.Frequency of improper shade by dye

Failure of non-compliance of the shade:

$$\text{Noncompliance percentage} = \frac{\text{Quantity of non compliane part (colorant X)}}{\text{Quantity of total non compliance part}}$$

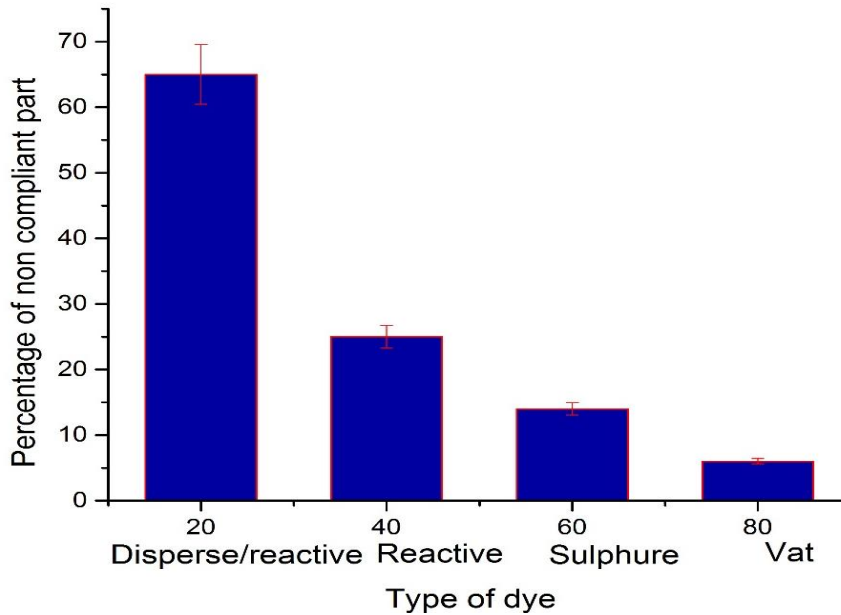


Figure 7.Plain wrong frequency by dye

Based on these two charts is observed for both defects, the type of major non-dye responsible for quality, are dispersed / reactive mixtures

2.1.1. Interpretation

Strengths

- ✓ An acceptable frame rates for responsible workers

Weak points

- High rate of dyeing defects.
- Significant rate of absenteeism.
- Qualification and limited experience of staff of the service.
- Lack of workers motivation system.
- A quality that costs dear.
- Poorly-optimized detection cost.

2.2.External diagnostics

Table 3. Skills of production worker

	production		
	Reactivity (/ 10)	Experience	Attendance (rate of absence)
Worker1	300	3	7.5
Worker2	6	5	2.5
Worker3	5,5	3	5
Worker4	4	8	2.5
Worker5	7	5	3.75
Worker6	6	7	1.25
Worker7	5	5	.625
Worker8	6	9	1.875
Worker9	9	8	5
Worker10	8	7	3.125
Average			3.3125

Human Resource (External):It manages many areas involved in all stages of the "life" of employees. For making the skill level of employees, but also to improve their motivation when diagnosed as non-external one must *consider the skills of each worker to assign the tasks that will optimize performance*

We must also take into account the qualifications of maintenance staff and that of the developer in the sampling service.

2.2.1. Diagnosis Sampling Service

The color matching service is required when the color chart provided by different manufacturers is not enough to determine the best color for dyeing

For achieving true results requires that all devices be calibrated and verified. In diagnostic sampling and development department we noticed that lack of spectrophotometer & other quality oriented machines in dyeing company. It is required when such standard features and compare desired product batches with this standard. Colorimetric then separates the color in different parameters (hue, brightness, saturation) and comparison of specification.[10] The measurement of these parameters is performed through a spectrophotometer.

When developing the recipe must consider the heat exchange due to exothermic and endothermic reaction and auxiliary reaction of some agents. Some developers are not experienced for consulting these

side reactions. Also during sampling, chemists are just initial rough mixes, test and then corrects them, after than achieve to 5 and 6 corrections.hhigher correction rate which results in a loss for sources 1, dyes and auxiliary agents.[11]

2.3. Maintenance Diagnosis

It takes into account the number of breakdowns of each machine

Table 4. Frequency of outages per machine

Machines	1	2	3	4	5
Number of outages per month	2	0.5	0.33	0.15	0

The machine 1 falls on average 2 times a month down so it generates dyeing defect. You cannot take the risk of executing a dye with a vat dye or a dye soluble which imposes a constraint to productionMaintenance should ideally be conducted in two forms: anti toxin and remedialconservation. Anti toxinconservation is regular maintenance of machines based on their technical documents. Indeed the weekly maintenance manager gives preventive conservation of 1st level to the operator of each machine. Remedial conservation is an intervention service technicians after equipment failure[12]. The worker application for action frequently follows a breakdown. The maintenance crew examines the breakdown, repair the defective part or replace it with another new one[13].

Re medial conservation maintenance is adopted in the company despite the high rate of failure.

2.4. Diagnostic output

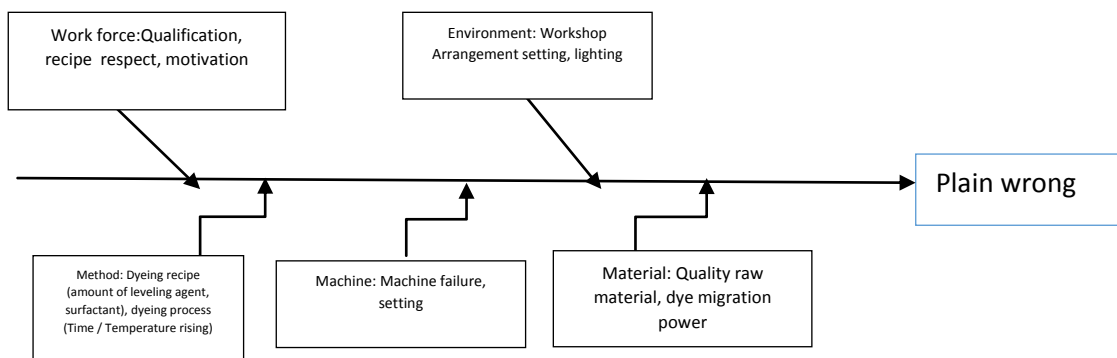
2.4.1. Disrespect of the recipe

Trough diagnosis some workers have trouble deciphering the income obtained from the development department. It also happens that some workers are not careful when dosing chemicals. Improper pH can cause improper activation of the dye. Program would not omitexactly otherwise you risk damaging the material or not having the desired results. The addition of the agents must be in precise primitive order to be effective

2.4.2. Process respect

Changes in the temperature and the duration of the process greatly affect the dyeing, in effect each time a dye and an adsorption temperature, migration and attachment. Do not follow the process may result in a completely botched dye. The process is however observed in this case. Supervision of production: During production detection of fault to protect and prevent loss of production a worker or technician is usually responsible for oversee production. It must be alert and responsive and perfectly autonomous. Sometimes the colors controls with clear shades are discharged from the autoclave at a close distance of the darker shades or put next to the machines that lie inside steps of dyeing shade darker. This creates concern tasks to be processed[14].

2.5. The cause and effect diagrams:



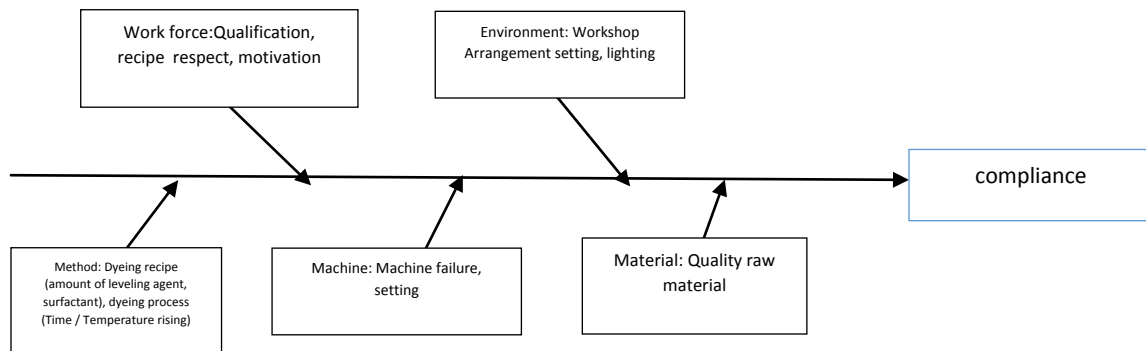


Figure 8. Cause and effect diagrams

2.5.1. Interpretation

Based on the circumstance paradigm deduced diagnostic performed we note that the main causes of the problems faced by the dyeing enterprises are failures machines, the qualification of workers and working methods:

Failures machines: Frequent breakdowns and repair delay. Qualifications of workers: Untrained workers unmotivated and few. The method classified two main factors:

The recipe developed by the service development or non-correspondence between it and the one used in the production especially that for cotton / PES mixture. The components of income affecting the smooth running of the dye can be: Quantity of colorant to get the required nuance: Who can be the non-calibrated equipment used by the sampling service.

Quantity of leveling agent or performance impact on coloration process Surfactant which improves penetration of the bath liquor in the fiber core Non controlled pH [15]. Imprecision Compliance with the customer recommendation due to lack of spectrophotometer is also a reason for problem.

The process used The Duration and temperature mounted that influences the level dyeing (avoid high temperature providing a plating problem). Time Adding the PAT. Quantity of PAT added every moment

Other parameters may also influence the quality of dyeing. Among these the fact that some workers remove the lid of the machine to make sample during dyeing (on pieces made) thus causing a malfunction in the process (eg temperature drop)

2.5.2. Proposed improvements

To propose solutions to the causes of problems already identified dyeing, we exploit the brainstorming method on forms distributed to the heads of departments concerned for collecting ideas for achieve a workable solutions that can converge attribute of enterprise to 5 Total Quality zeros. These ideas are then studied to offer the most solutions following interesting:

Improve control tool by increasing the control frequency courses (each 15 minutes instead of 30 minutes) and run random checks before delivery of the product for ensuring best commodity quality. [16] Train controllers and try to empower them. Lighting used for final control controllers must be similar to the daylight to facilitate Optimize the detection cost by optimizing amount of controllers for better control. [17]

Developing trait of dyeing: Reduce machinery breakdowns: To reduce downtime machines that come mainly machine "1", it is better to replace this machine or change mechanical parts causing these frequent breakdowns. In case the change of the machine is difficult it is better to charge this machine the small order to slow the rate of defects. We must maximize the use of machinery spare parts are easily accessible. It is better to use these machines as are difficult to repair. Use a chemist or qualified enough finisher for correcting specification. Improving development service equipment to cancel the gap developed shades and those found after calibrating the production or the substitute Buy a spectrophotometer.

2.6. Basic database of dyeing problems

A simple database developed on Microsoft Excel. In this database, we will record any defects encountered by the company's quality service. The database can of course be enhanced and customized the specification **Home page**

of the service. Finally, the database must be operated as a dashboard or defects are displayed resulted in diagram form of Pareto. If the data is set to days, the chart will display the trivial defect each day / week or season.

Homepage has buttons for easy access to the interface we need; it is as follows:

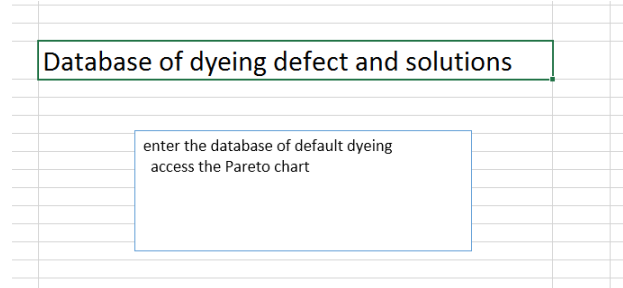


Figure 12. Home of the data

In this page, we can study the defect types and their quantity that can vary by using forms filled during control. This part calculation also the number of faults. [18] As you can see, there is a sort button that, when clicked, the Data class: the most important defects in quantity at least defects important.

Table 5. Display of dyeing faults recorded

Complaint type	No of complaint	Cumulative no	Cumulative %
united	41	41	44.56521739
No compliant shade	39	80	86.95652174
Several shade	5	85	92.39130435
break	4	89	96.73913043
footsteps	3	92	100
spots	2	94	102.173913
hole	1.5	95.5	103.8043478

2.7. Automatic display of Pareto diagram

The Pareto chart is displayed on this page, investigating chart the quantities modified and may be updated. It displays faults in downward order to identify defect to be corrected at the earliest. [19]

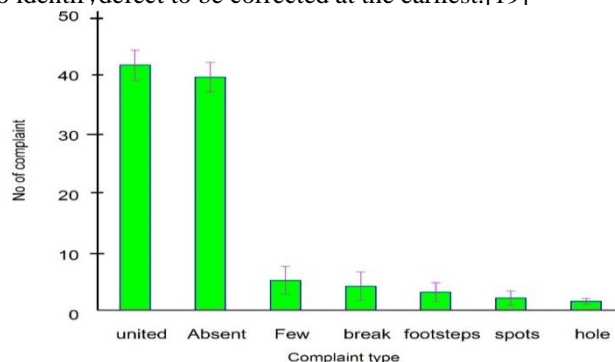


Figure 10. Pareto Chart

3. Conclusion

Different types of dyeing faults are appeared in the quality section in the dyed fabric after the finishing process like shade variation, running & uneven shade, spirality problem, GSM problem, shrinkage problem, twisting problem, oil marks, crease marks etc. Due to the presence of such problems in the fabric, the fabric could be rejected from the garments section or buyer. So it is extremely important for the dyeing floor to identify such problems & also to rectify them properly. By using the database properly it's easier to identify the problem & go for corrective

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actions if needed. In the approach to any problem is to define a strategy to follow, it takes undertake to accomplish the desired results .The strategy we have adopted for our problem is to detect abnormalities affect the performance of a given company and try to correct it by revamping all the cost of the company and the decreasing the expense. Moreover the creation of a tool (database) that helps to monitor quality. We then tried to adopt a collaborative brainstorming with leaders of the company to try finally as a happy employee is a productive employee, it is wise to say that happy customer equals a successful business.

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