Inventory Management Analysis: Addressing Deadstock and Stock Discrepancies

Mid-term Submission for the BDM Capstone Project

Submitted by

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Contents

1 Executive Summary

This project is about Jothi Polymers Private Limited which manages Business-to-Business activities that deal with engineering polymers and other plastic-related materials.

The major problem faced by the company, as stated earlier was deadstock which leads to less or no particular stock movement. For this stock procurement and movement data was collected for 6 months. Previously 3 years data was considered, but 6 months data was enough to make analysis as it was repetitive.

They also faced stock mismatches in warehouses for which previous mismatch data and reason for it was manually updated.

The main aim of this submission is to find which might potentially become deadstock and the financial impact created by it, so that it makes it easier to analyze. Key Performance Indicators for the deadstock and stock mismatch analysis is found which were mainly money-based. Also, which supplier's stock mainly led to deadstock accumulation was found.

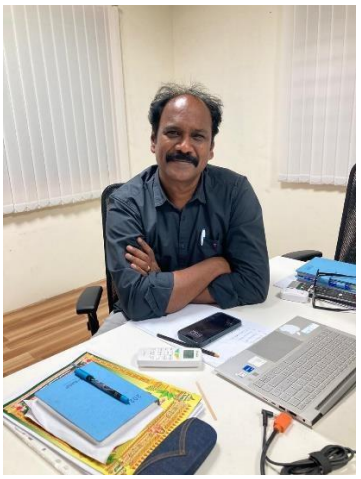
In this phase, data was collected and updated in Excel sheets to draw insights. Python libraries like pandas and matplotlib were used for data cleaning and results/findings.

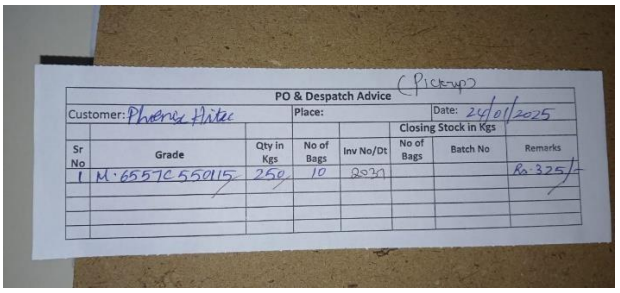
In this submission, considerable insights were obtained which makes it easier to make suggestions and draw a solution mechanism to the company. This further helps them to leverage the solution in making a financial analysis on managing loss from these two problems.

2 Proof of Originality of Data

Company name: Jothi Polymers Pvt Ltd.
Owner Kalyana Sundar
Address: 08, Arunachalam St, Rajiv Gandhi Nagar, Nesapakkam, Chennai, Tamil Nadu 600078

2.1 Images related to the organization:





2.2 Letter from Organization:

Jothi Polymers

Jothi Polymers Pvt. Ltd
No. 8, Arunachalam Street,
Rajiv Gandhi Nagar,
Nesapakkam, Chennai – 600 078.

January 25, 2025

TO WHOMSOEVER IT MAY CONCERN,

Subject: Permission to Utilise Company Information for the IITM Business Data Management Project.

Regarding the **IITM** Business Data Management Capstone Project, we, **JOTHI POLYMERS PRIVATE LIMITED**, grant **Mr. ARVIND M (Roll No. 23f2005701)** permission to view and use our company's stock and other relevant data.

The data may only be utilised for academic objectives related to the project in question, such as analysis and problem-solving. It is acknowledged that our company's prior written authorisation is required before the data is utilised for any non-academic reasons.

We have certainty that any applicable data protection rules will be followed, and that the data will be handled with the highest confidentiality.

Yours Sincerely

For JOTHI POLYMERS PRIVATE LIMITED

[B. KALYANASUNDAR]
[DIRECTOR]

JOTHI POLYMERS PVT. LIMITED CHENNAI 600 078

Email: jothipolymers@gmail.com / info@jothipolymers.com
Tel: 044-24718494

2.3 Video interaction with owner link: https://drive.google.com/file/d/1Bhr0FY2Lj_fru4-RQjfJw2giLBxCWA87/view

3 Metadata and Descriptive Statistics

- After interacting with the firm, the collection of 6-month data regarding the receiving and movement of various stocks was done for analyzing deadstock. This data corresponds to January to June stock movement for the year 2022 and is in comparison with 2024 December to assess days since the last dispatch.
- For stock mismatch, several grades were mismatched in the past, and their reason was noted manually and updated in Excel.
- **Dataset Drive Link: https://drive.google.com/drive/u/3/folders/1J43C-KTwmDNOcmtHvbbaQszGNBJZ7OiU**

Stock ID	Supplier	Grade	Quantity	Rate(in Rs.)	Value(in Rs.)	Days Since Last Dispatch	Received Date
C1001	Covestro	B. FR3000 704706 BK 150W	75.00 KGs	173.33	13000.00	732	15-Jan-2022
C1002	Covestro	B.FR3000 901510 BK150W	25.00 KGs	255.52	6387.93	353	03-Jan-2022
C1003	Covestro	B. FR 3010 500018 BK 150W	1800.00 KGs	202.00	363600.00	452	11-Jan-2022
C1004	Covestro	B-FR3010 901510 BK 150W	225.00 KGs	275.00	61875.00	552	02-Jan-2022
C1005	Covestro	B.FR 3210TV 500018 BK 150W	1800.00 KGs	202.00	363600.00	752	09-Jan-2022
C1006	Covestro	B.T45PG000000BE100W	550.00 KGs	321.82	177000.00	661	12-Jan-2022
C1007	Covestro	B.T65XF 000000 BK 150W	50.00 KGs	225.00	11250.00	931	07-Jan-2022
C1008	Covestro	B. T65XF 704167 BK 150W	3500.00 KGs	345.00	1207500.00	431	10-Jan-2022
C1009	Covestro	B. T65XF 900812 BBS910 BA100W	25.00 KGs			489	03-Jan-2022
C1010	Covestro	B.T65XF 901510 BK 150W	4300.00 KGs	290.00	1247000.00	184	05-Jan-2022

Deadstock Analysis Data

- This dataset is present in Excel format to easily make comparisons with another dataset for drawing overall financial impact.

- The first column contains Stock_ID which acts as a unique identifier for a particular stock which might play a key role in future solution development. The second column indicates the supplier for each grade of stock. The third column contains the grade of stock that is received which might potentially become deadstock. The fourth, fifth, and sixth column contains quantity which minimum has to be 25kgs, their market rate (in Rs), and Value (Qty X Rate). The next column contains days since the last dispatch of the product concerning the current situation and the last column contains the date the stock was received.

Grade	Warehouse stock(in kgs)	Office Stock(in kgs)	Mismatch	Actual Value(in Rs.)	Current Value(in Rs.)	Financial Loss(in Rs.)	Reason for Mismatch
M.2865C 700892 BK150W	907	917	Yes	320950	317450	3500	Supplier Issue
PI-RYL 120 NAT	809	809	No	257262	257262	0	-
Technyl Red J 218 HP V35 Black 21N	742	752	Yes	230864	227794	3070	Wrong Entry
M.2856P 901510 BK 150W	291	301	Yes	69531	67221	2310	Wrong Entry
MAKROLON 9425C 012901 BK 150W	58	68	Yes	17068	14558	2510	Illiteracy
ULTRAFORM N2320 008 AT UNCOLORED	811	821	Yes	177336	175176	2160	Supplier Issue
B. T85XF 902063 BBS910 BK 150W	524	524	No	155104	155104	0	-
M.2407C 250050 BK150W	580	590	Yes	132160	129920	2240	Lost
M.2407C 651566 BK150W	961	961	No	254665	254665	0	-
M.2405C 010203 BK50W	840	840	No	278880	278880	0	-
M.2405C 450601 BK150W	462	472	Yes	134520	131670	2850	Supplier Issue
PP 30GF NAT	244	244	No	50508	50508	0	-
NGC - 1501 BLACK	452	452	No	101248	101248	0	-
M.2807C 321498 BK 150W	358	358	No	86994	86994	0	-
M.2407C 300363 BK 150W	384	384	No	94848	94848	0	-
ULTRAMID 2512MF8 WHITE 1378	213	213	No	48564	48564	0	-
M.6265XC 012829 BK 150W	499	509	Yes	174078	170658	3420	Illiteracy
B.FR3000 901510 BK150W	714	714	No	144942	144942	0	-
G 60A 11 54760	141	151	Yes	39713	37083	2630	Wrong Entry
M.2405C 450601 BK150W	341	341	No	74338	74338	0	-
ULTRAFORM N2320 008 AT UNCOLORED	390	400	Yes	90000	87750	2250	Supplier Issue

Stock Mismatch Data

- This dataset is also present in Excel format.

- This dataset contains several grades of stock, their opening stock (office stock) and closing stock (warehouse stock). It tells us whether a mismatch exists or not with its actual value and current value and loss amount(actual-current). Finally, the reason for the mismatch was found and updated manually. This dataset also contains stock in which mismatch is not present for better dispersion.

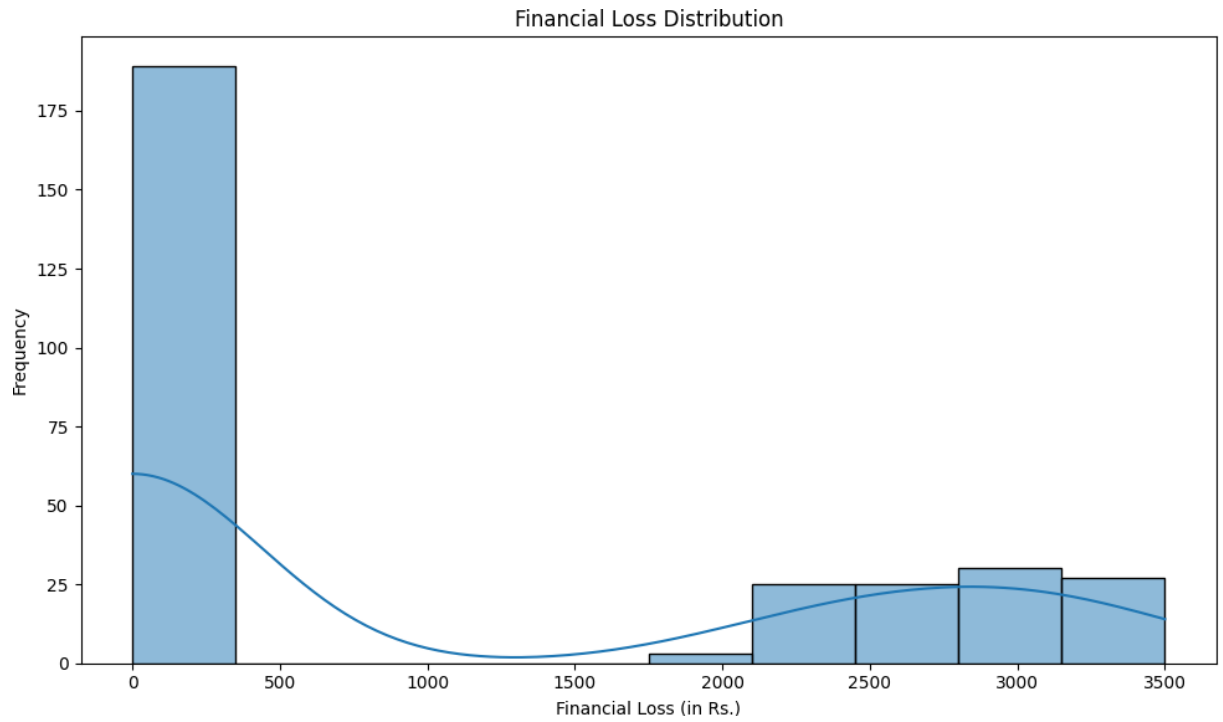
Descriptive Statistics for the above datasets are as follows:

Descriptive Statistics for stock-mismatch.xlsx:

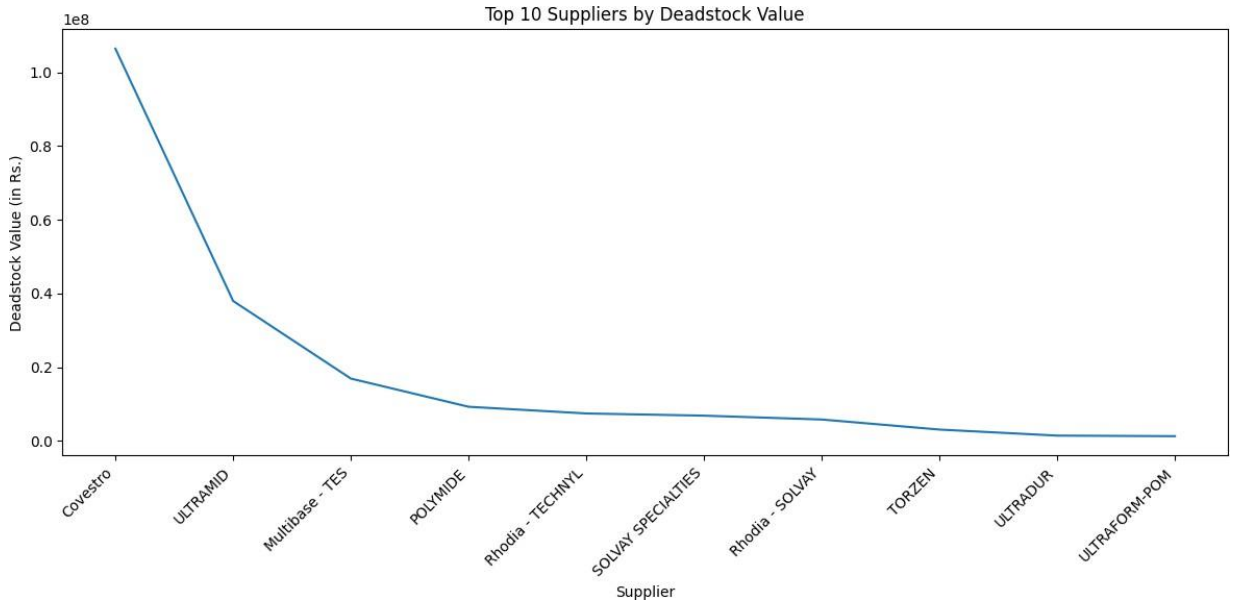
	Warehouse stock(in kgs)	...	Rate(in Rs.)
count	299.000000	...	299.000000
mean	540.508361	...	274.956522
std	274.903368	...	44.786235
min	48.000000	...	200.000000
25%	299.500000	...	231.500000
50%	565.000000	...	277.000000
75%	766.000000	...	316.500000
max	999.000000	...	350.000000

Descriptive Statistics for deadstock.xlsx:

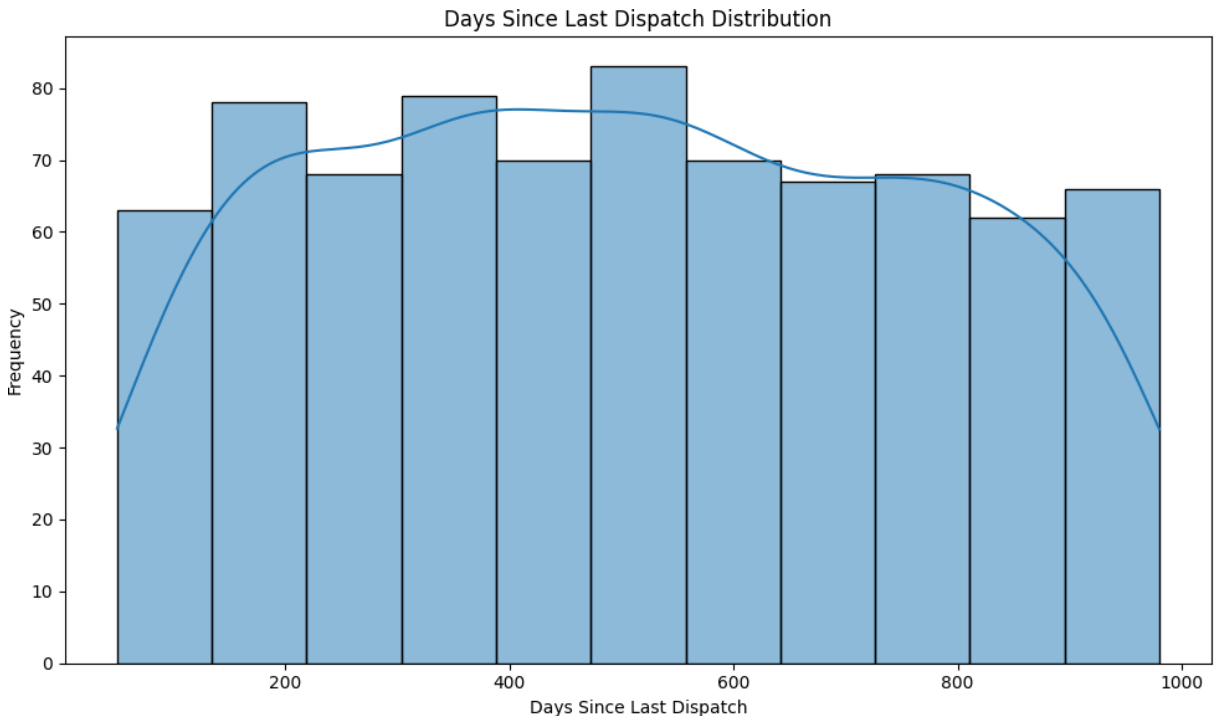
	Quantity	Rate(in Rs.)	Value(in Rs.)	Days Since Last Dispatch
count	774.000000	774.000000	7.740000e+02	774.000000
mean	1085.868217	242.444419	2.748316e+05	507.976744
std	1410.355860	207.993589	4.858346e+05	262.039240
min	1.000000	0.000000	0.000000e+00	50.000000
25%	400.000000	173.330000	5.005131e+04	289.250000
50%	992.500000	230.000000	1.935750e+05	504.000000
75%	1488.750000	295.000000	3.435704e+05	728.750000
max	23400.000000	2090.000000	7.021363e+06	980.000000



This histogram is effective in showing the count of financial loss attributed to various stock grades. This shows that a financial loss of Rs.3000 is most common and mostly minimal loss (Rs.0-250) occurs.



This line plot shows which supplier contributes to maximum deadstock. On noticing, it is seen that Covestro supplies maximum stock that might become obsolete in the future. This can be due to Covestro supplying various grades at the same time.



This histogram shows what is the frequency of the range of days since the last dispatch. It can be observed that most of the stock between 500 to 600 days potentially becomes deadstock with a maximum count of above 80.

4 Detailed Explanation of Analysis/Method

Data is present in Excel sheets. Python libraries like pandas, seaborn, and matplotlib were primarily employed to perform data cleaning, exploration and, finding relationships as follows:

- **Data preparation**: The deadstock data was present in tally and was converted to Excel format(.xlsx) for easier understanding and analysis. The stock mismatch data was manually prepared using interaction with the workers and past mismatch reasons.

- **Data Cleaning**: The obtained data was cleaned using Python's library pandas. The Excel sheet was converted to a data frame. The Grade column was standardized to prevent variations in naming. The missing values in numeric columns such as opening stock, closing stock, rate, etc., were filled with the corresponding column's mean value, and necessary columns were converted to numeric type. The date column was also standardized.

- **Data Exploration**: After the data was ready, several techniques such as aggregating, sorting, etc. using pandas describe () and other functions were conducted to draw insights and understand the data.

- **Relationships and Root Cause Analysis**: Several bar charts, line plots and histograms were plotted to understand the frequency pattern for each column. This helped in understanding the range of an attribute that led to a particular problem. For example, days since the last movement vs frequency histogram helped in understanding after how many numbers of days, a stock becomes obsolete. This step further can be useful in making RCA.

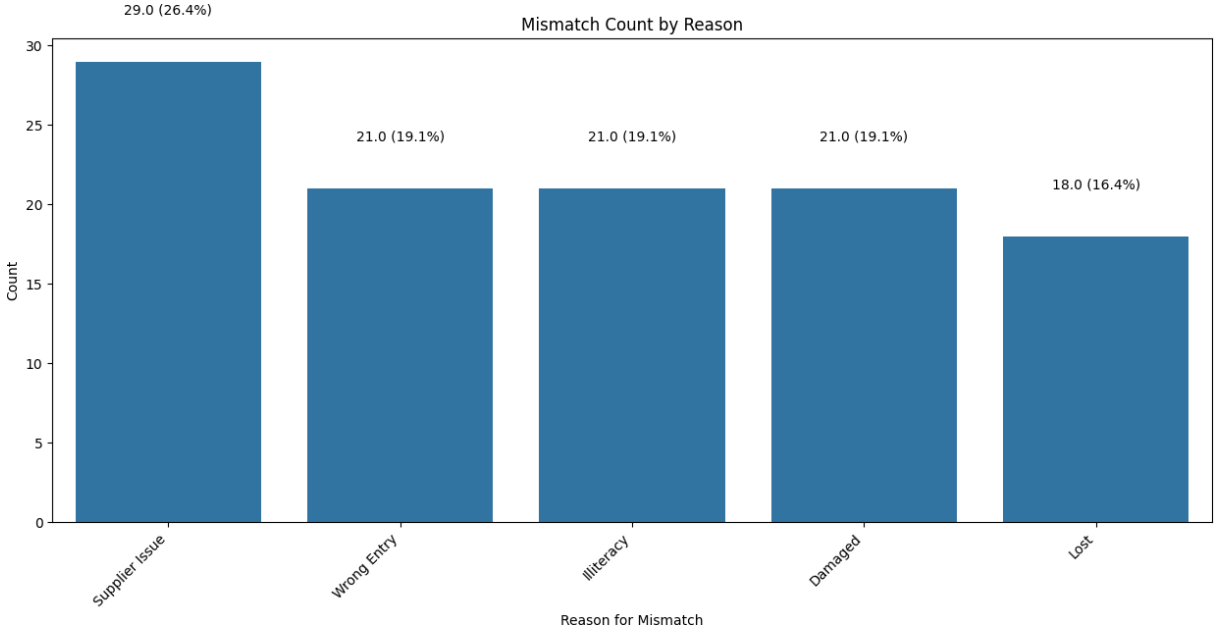
- **Interpretation**: After plotting histograms and bar charts, key parameters like financial loss and grades with the highest mismatches were found that can be used as Key Performance Indicators for solution development.

5 Results and Findings

- Based on the reason for the stock mismatch column present in the dataset, a Root Cause Analysis can be made to highlight specific areas needed for improvement.
- For analyzing deadstock, ABC analysis can be made as follows:

  1. Categorizing stocks as high, medium, and low-priority based on previous stock movement.

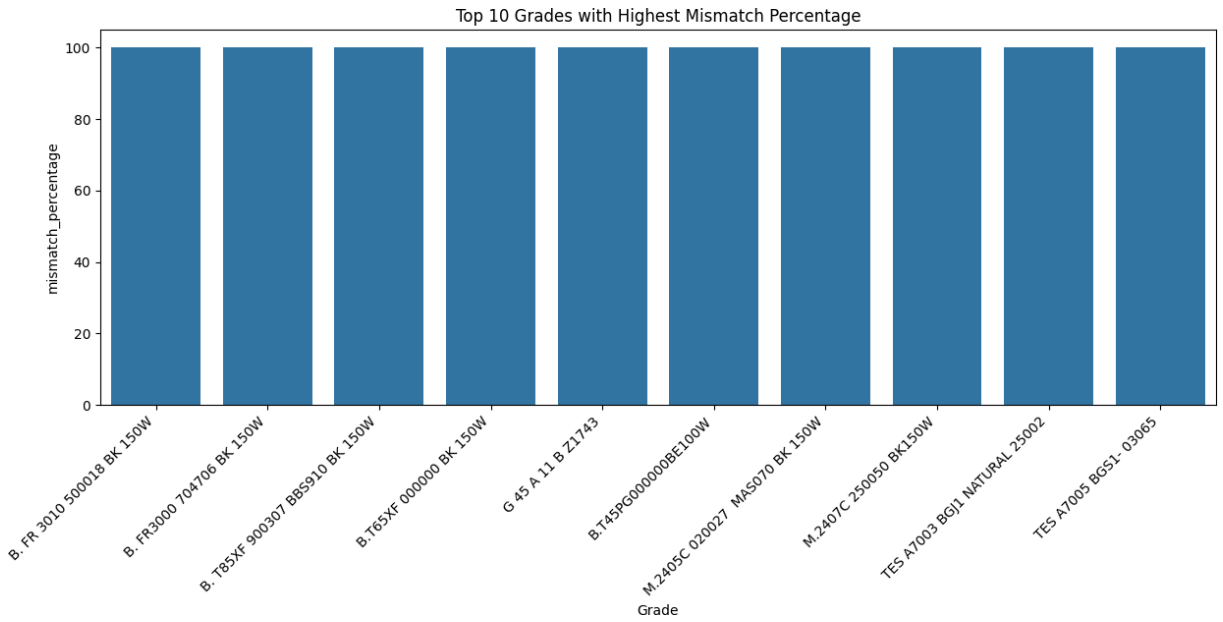
  2. Prioritize Inventory management efforts on high-priority items and thereby reduce stock count for low-priority items.



- This bar chart is helpful in understanding that supplier issue mainly leads to stock mismatches. This means that goods coming from suppliers are sent in the wrong quantities or miscommunication is prevalent.

- Other reasons like wrong entry, illiteracy, damaged goods, and stock loss also equally contribute to stock mismatches.

- This is essentially helpful in performing a Root Cause Analysis so that these issues can be overcome in the future.



- This bar chart shows the top 10 grades with the highest mismatch percentage.
- This is useful in identifying techniques to uniquely identify them and be cautious in the future.
- This helps in reducing the mismatch percentage and the loss generated due to them.

➢ As understood earlier, supplier Covestro accounts for maximum deadstock. This means financial loss is mainly due to stocks from them. ABC analysis will help identify which of their products is most useful as they supply a variety of items.