EDA / Descriptive Statistics

## Introduction:

In today's industrial landscape, machine downtime represents a substantial challenge, impacting productivity, efficiency, and overall profitability. This report delves into the critical issue of machine downtime, aiming to uncover patterns, causes, and potential solutions. By analyzing real-world data, we explore the factors contributing to downtime, examine the impact on different types of machines, and ultimately seek actionable insights to optimize operations and minimize disruptions.

## Overall design strategy

The data contained information about various parameters and the failure state 3 different machines.

It contained 2500 rows of information in 16 columns.

## Data Overview

The data was in csv format which was imported to SQL and checked and cleaned of duplicates, outliers, missing values and encoded data values. The resultant dataset contained 2500 rows in 18 columns of data.

After the data was prepared, EDA was performed on the resultant dataset, following the order of moment decisions and analysis of various parameters to find insights.

## Questions

Questions which will be answered by this analysis:

* What is the trend in the downtime state of machines?
* What are the leading causes of downtime?
* What metrics are responsible for failure of each machine?

## Describe Analysis and how it answers the questions

* What is the trend in the downtime state of machines?
  + Although failure rate of all the machines is near 50%, Machine\_ID - Makino-L3-Unit1-2015 is the one having most downtime.
  + It is closely followed by Makino-L1-Unit1-2013 (53.1%).
  + Analysis: Calculated the number of times each machine failed (and not failed).
* What are the leading causes of downtime?
  + Leading causes of downtime are:
  1. Low Hydraulic Pressure
  2. High Coolant Temperature
  3. Analysis: Calculated the average of various parameters for each machine when they were failing and observed & compared the output with the observations when they didn’t failed.
* What metrics are responsible for failure of each machine?
  + Makino-L1-Unit-2013
  1. Maintain Hydraulic Pressure around 100 bar.
  2. Maintain Coolant Temperature under 19 units.
  3. Maintain Torque above 23 Nm.
* Makino-L2-Unit-2015
  1. Maintain Hydraulic Pressure over 90 bar.
  2. Maintain Coolant Temperature under 18 units.
  3. Maintain Torque above 23 Nm.
* Makino-L3-Unit-2015
  1. Maintain Hydraulic Pressure over 85 bar.
  2. Maintain Coolant Temperature under 18 units.
  3. Maintain Torque above 23.5 Nm.

## Conclusion

The analysis points out that all the three machines are suffering with downtime due to low hydraulic pressure and high coolant temperature. The various metrics described in the report are the responsible for the issue.