



Process Control: E-paint Coating System

"Quality never goes out of style."

GROUP - 6

ISHITA DEODHAR - 21060641020

KARNALI NAIK - 21060641023

SANIKA MHAMUNKAR - 21060641042

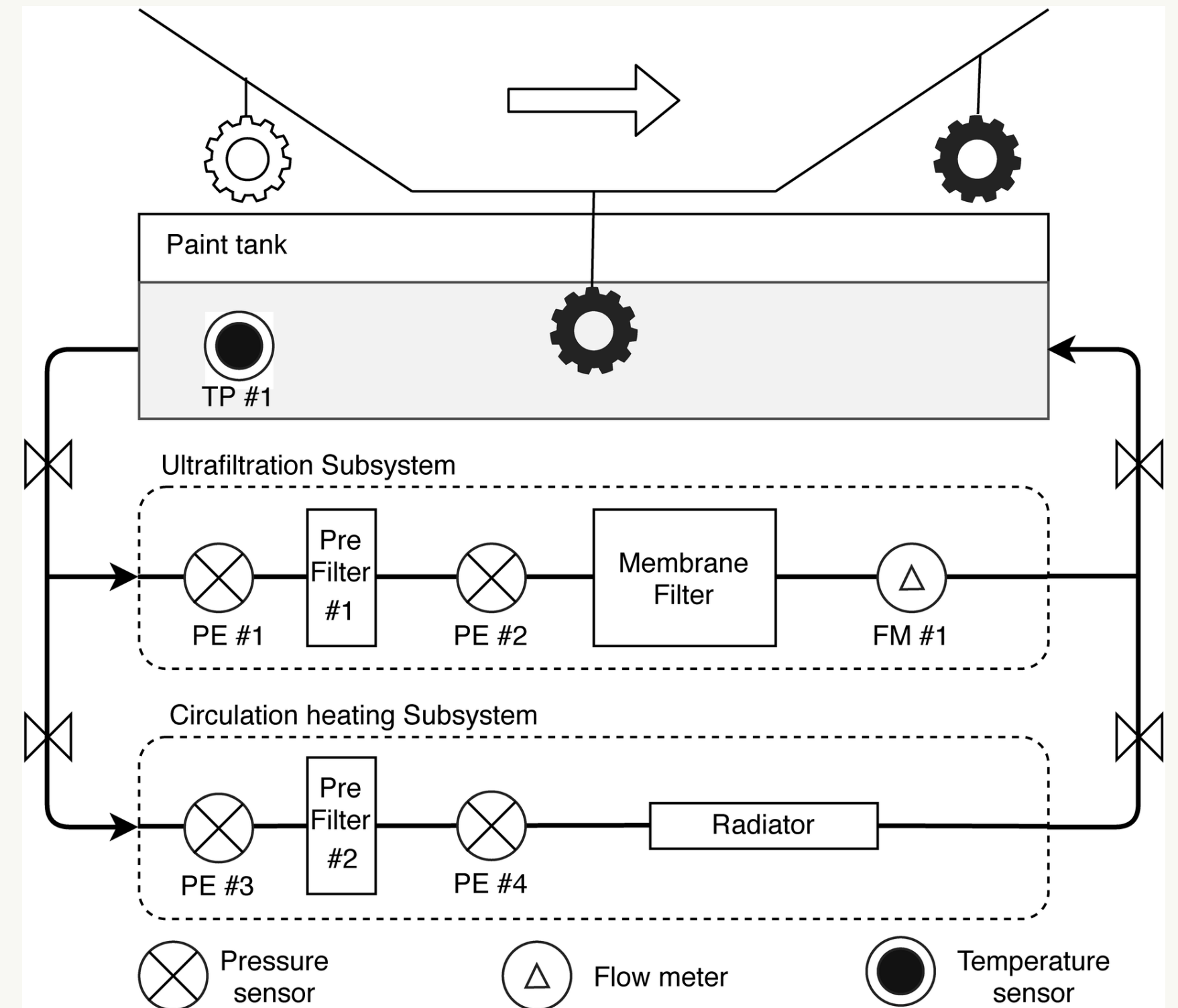
SANKET PATIL - 21060641043

SAYALI BORA - 21060641045

INTRODUCTION

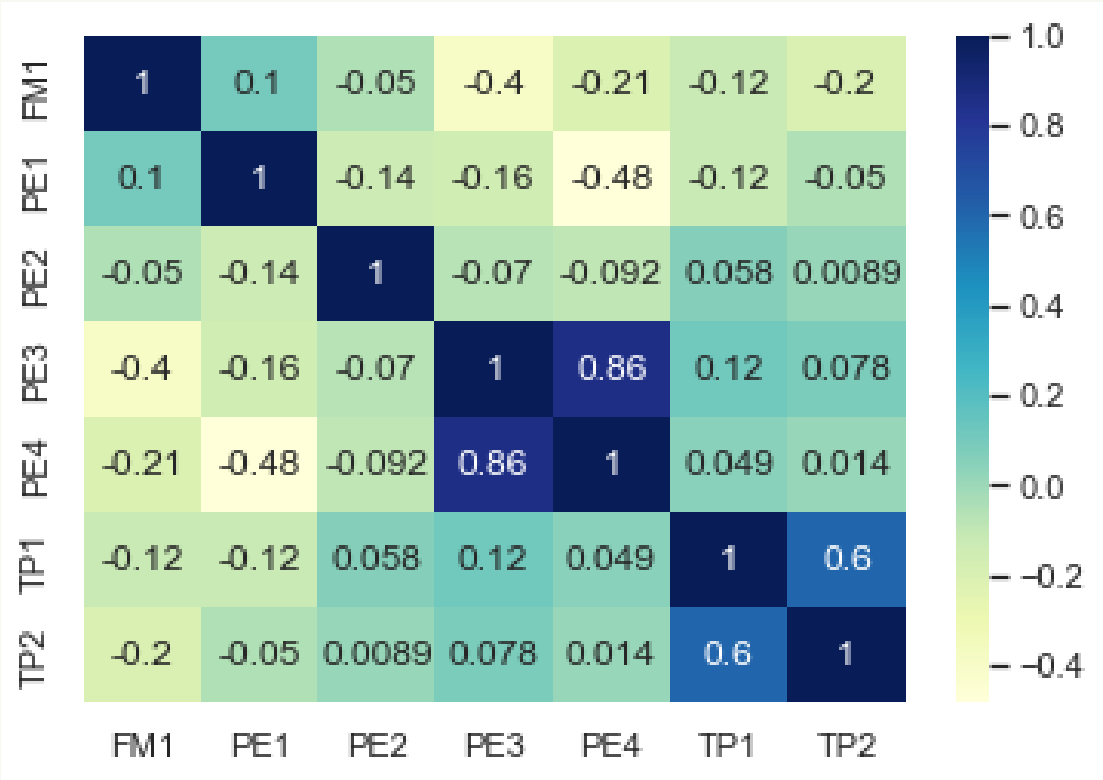
Beginning in the late 1950's, electrodeposition methods were developed to improve the corrosion resistance in automotive parts. Today, nearly all automotive manufacturers use this process to coat automotive components worldwide.

- **E-coating** : An immersion wet paint finishing process.
- **Electrophoresis** : Applies a semi-transparent, anti-corrosive coating to certain metals.
- **Ultrafiltration** : Separates a portion of the low molecular weight component of the paint bath from the main paint stream.



DATASET

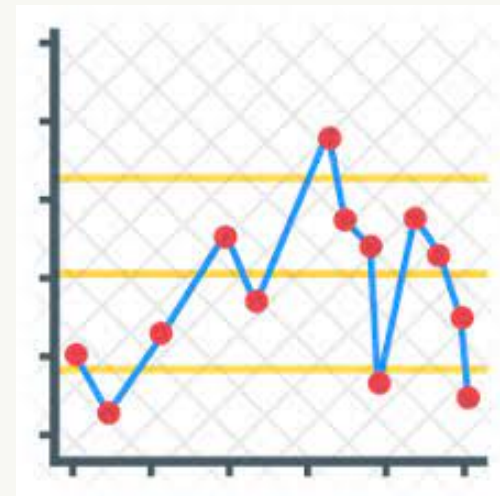
The data collected from the new installed IIoT system is high resolution but only 15-days measurement periods have not collected sufficient incident events such as equipment failures or maintenance activities.



Variable	Description
FM1	Flow meter 1 - Ultrafiltration subsystem
PE1	Pressure 1 - Input pressure for ultrafiltration subsystem
PE2	Pressure 2 - Output pressure for ultrafiltration subsystem
PE3	Pressure 3 - Input pressure for circulation subsystem
PE4	Pressure 4 - Output pressure for circulation subsystem
TP1	Temperature 1 - At the paint tank
TP2	Temperature 2 - At the radiator of circulation subsystem (optional)

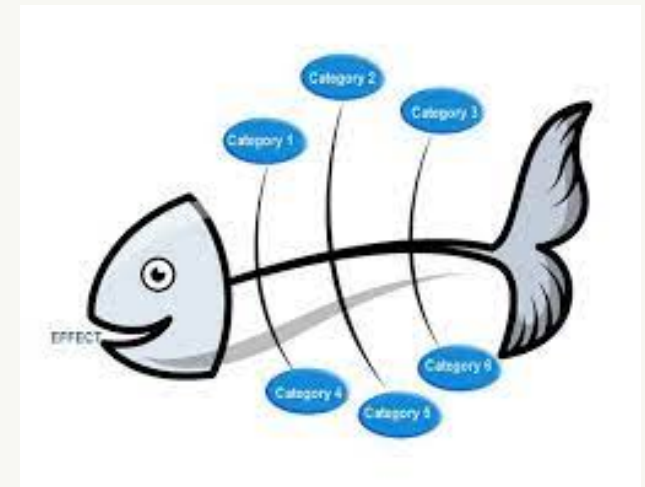
TOOLS USED

HISTOGRAM



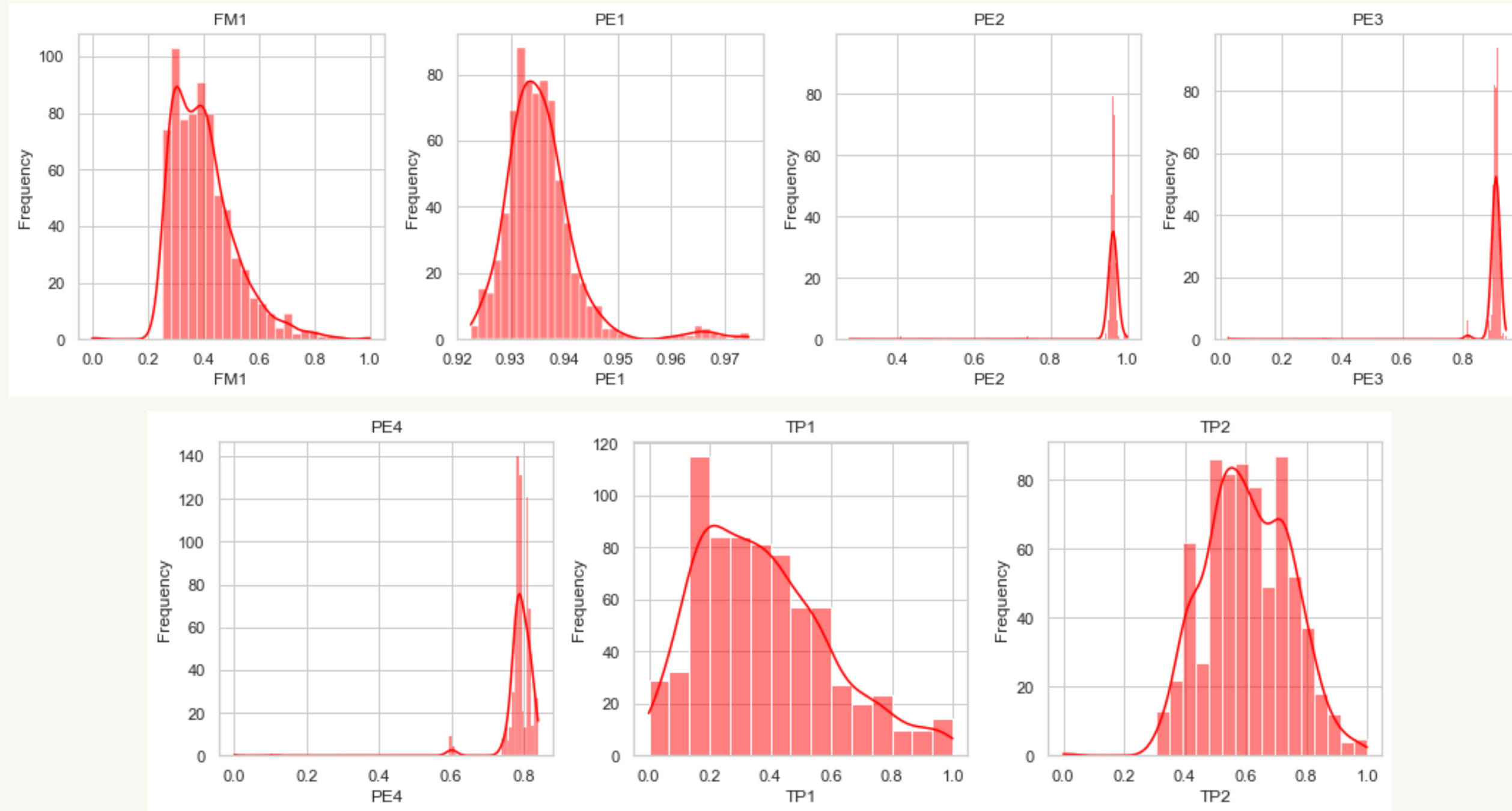
X-MR

CUSUM



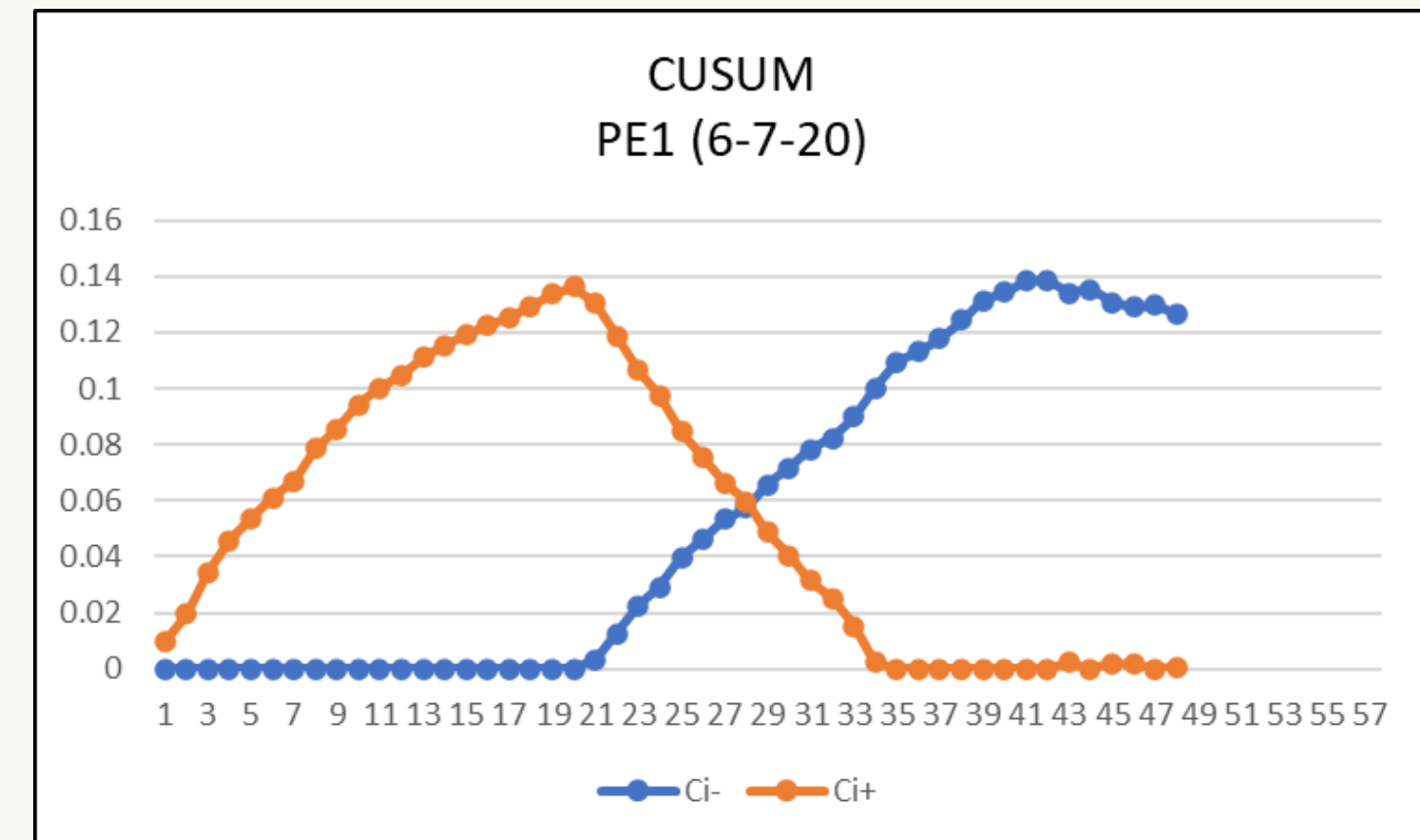
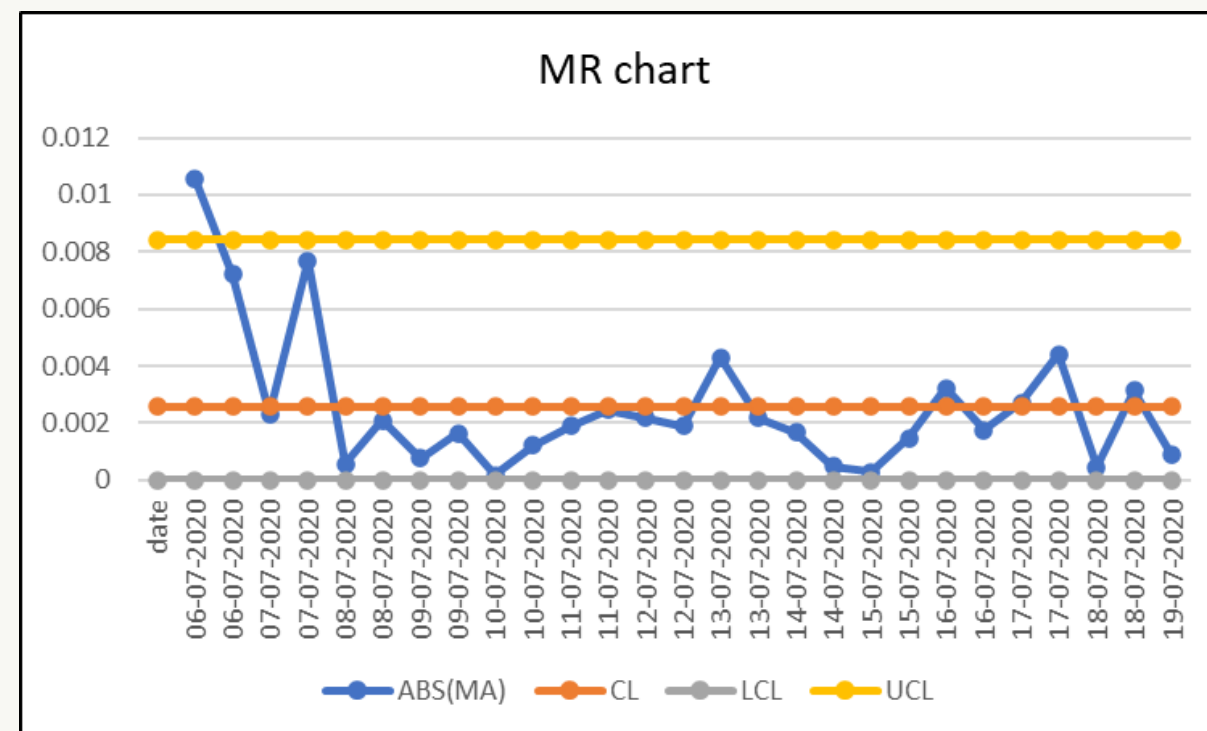
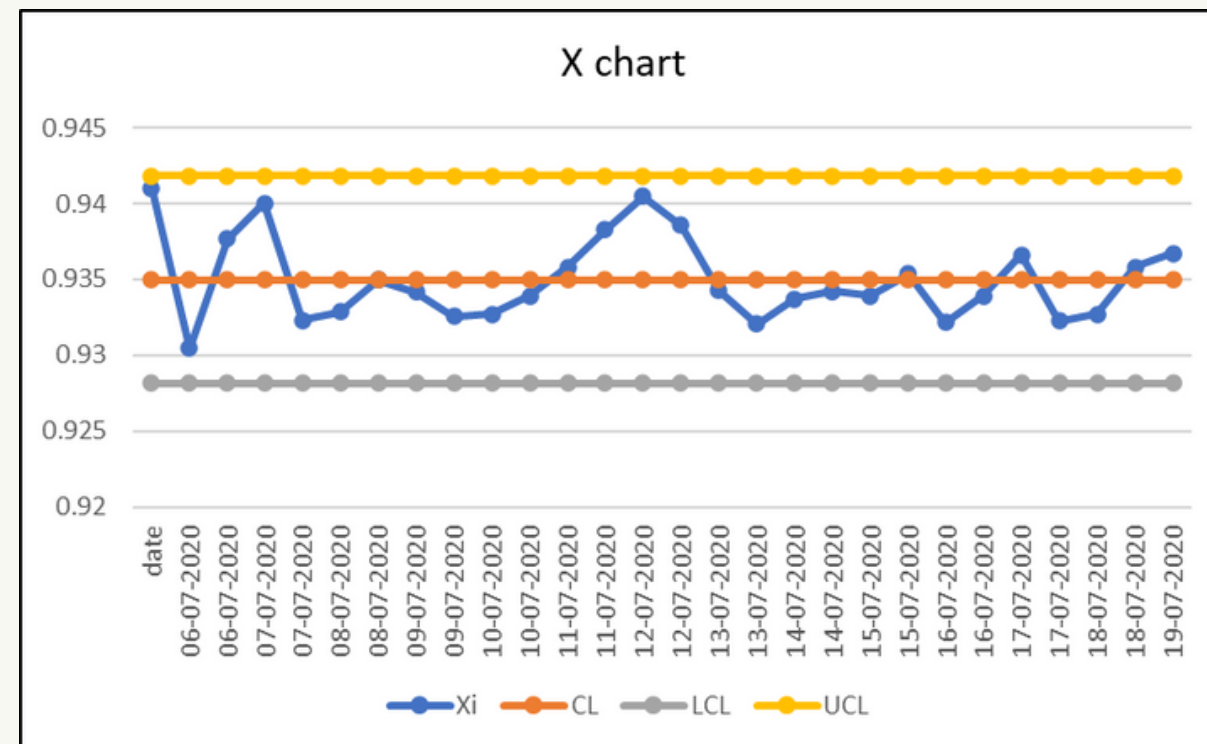
ISHIKAWA

HISTOGRAMS



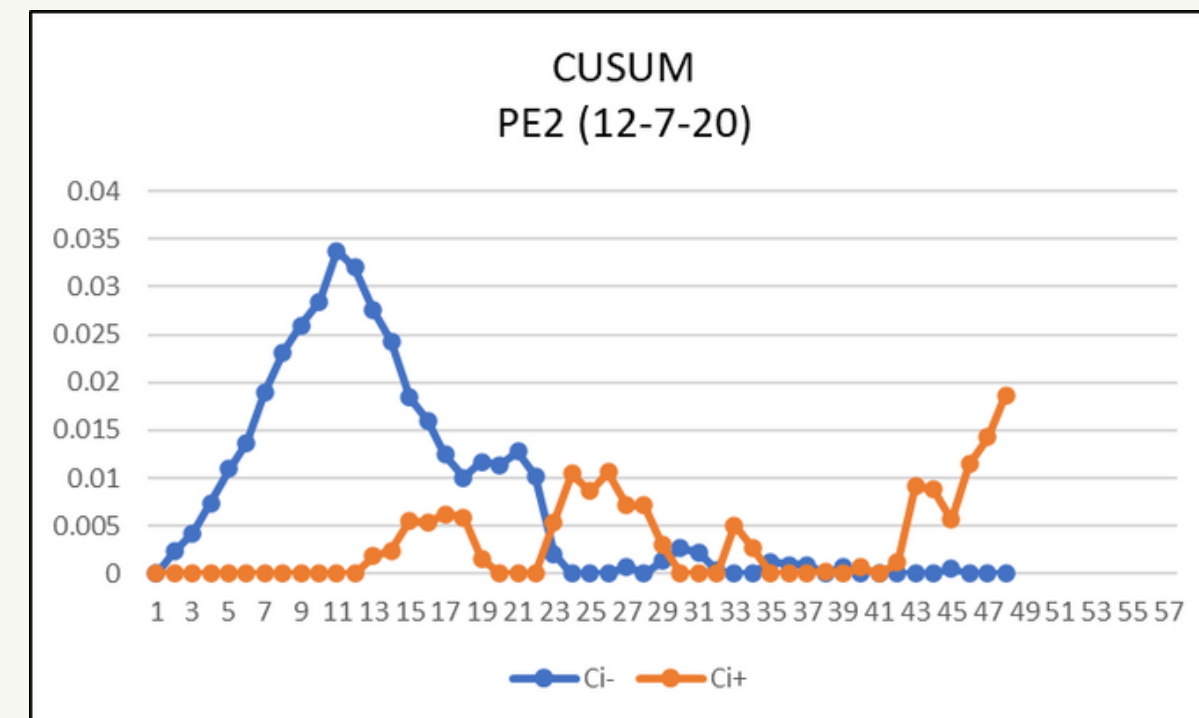
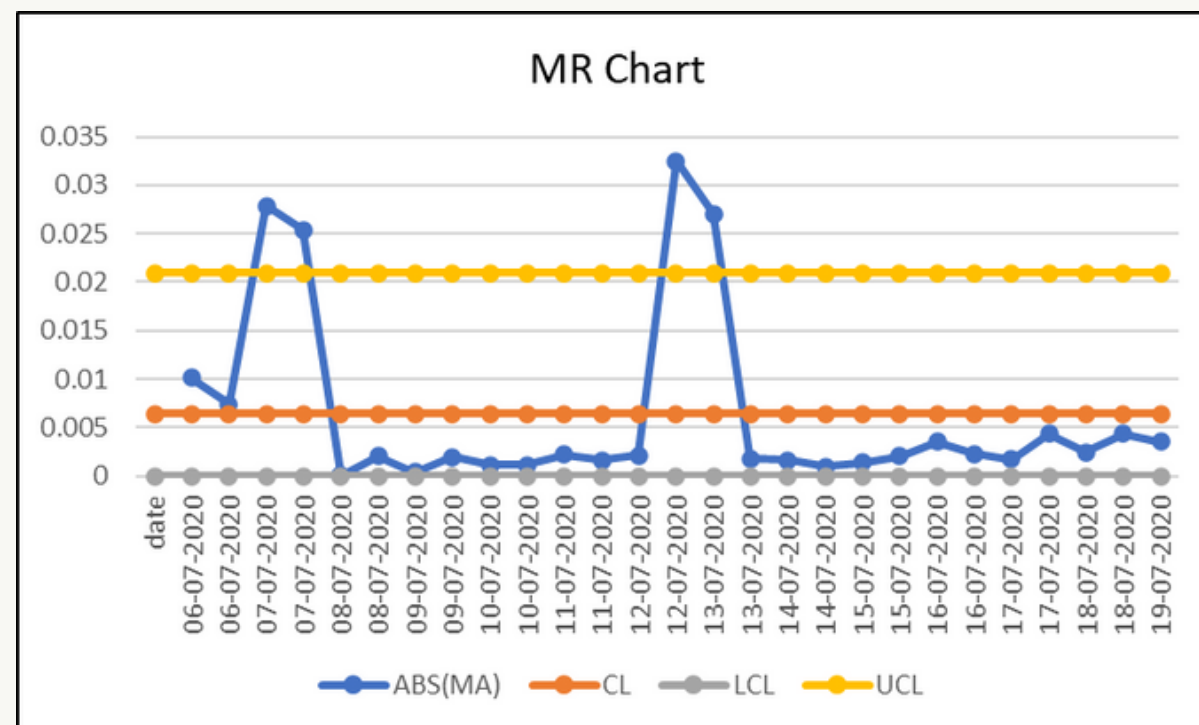
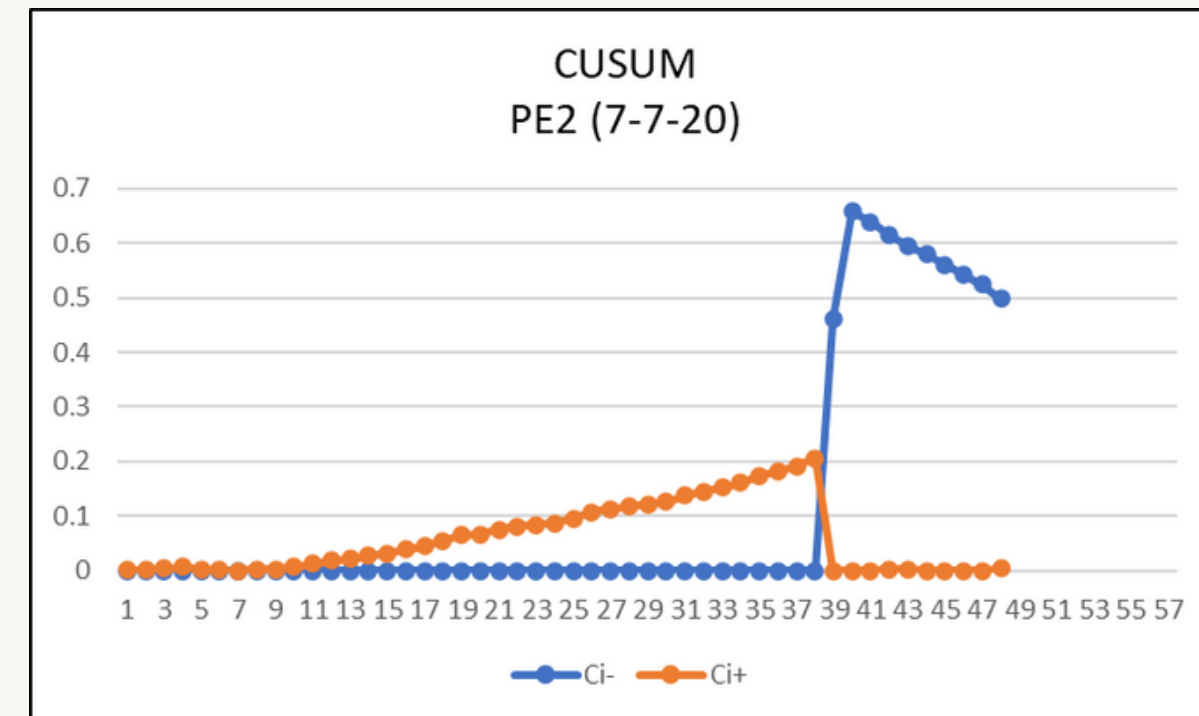
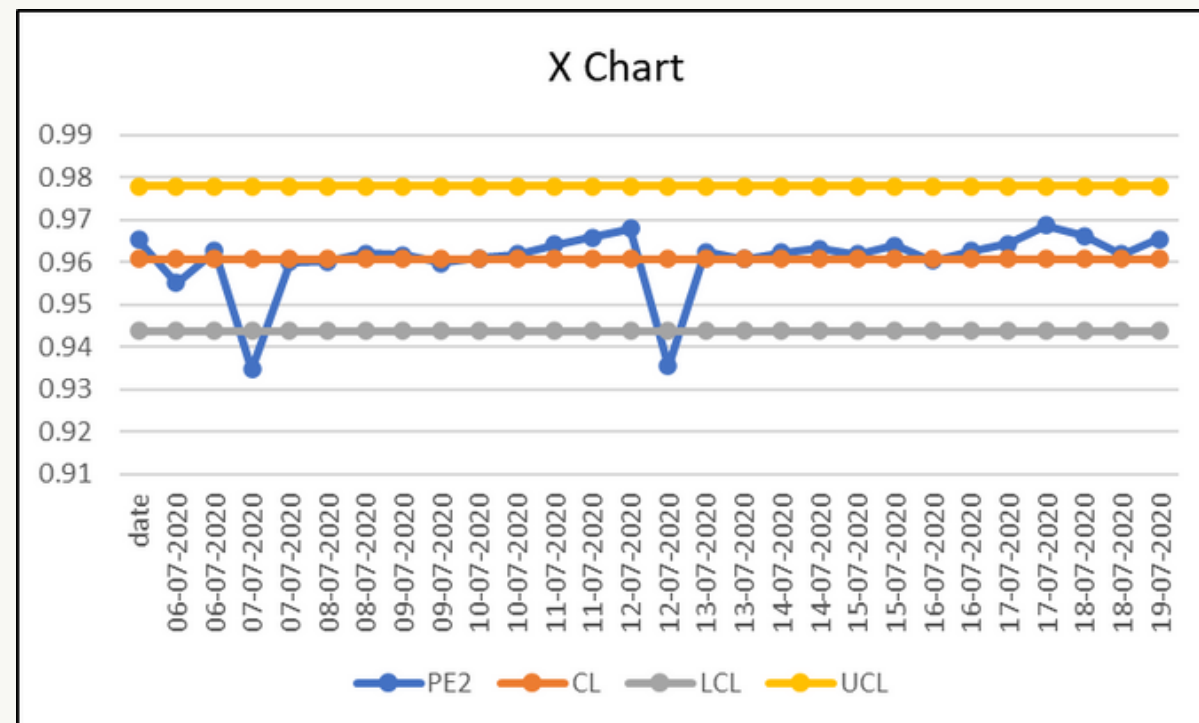
The sensor readings (also called features) have been normalised into range (0,1) . All pressure readings are quite close to 1, whereas the flow meter and temperature readings are distributed over 0 to 1.

PE1



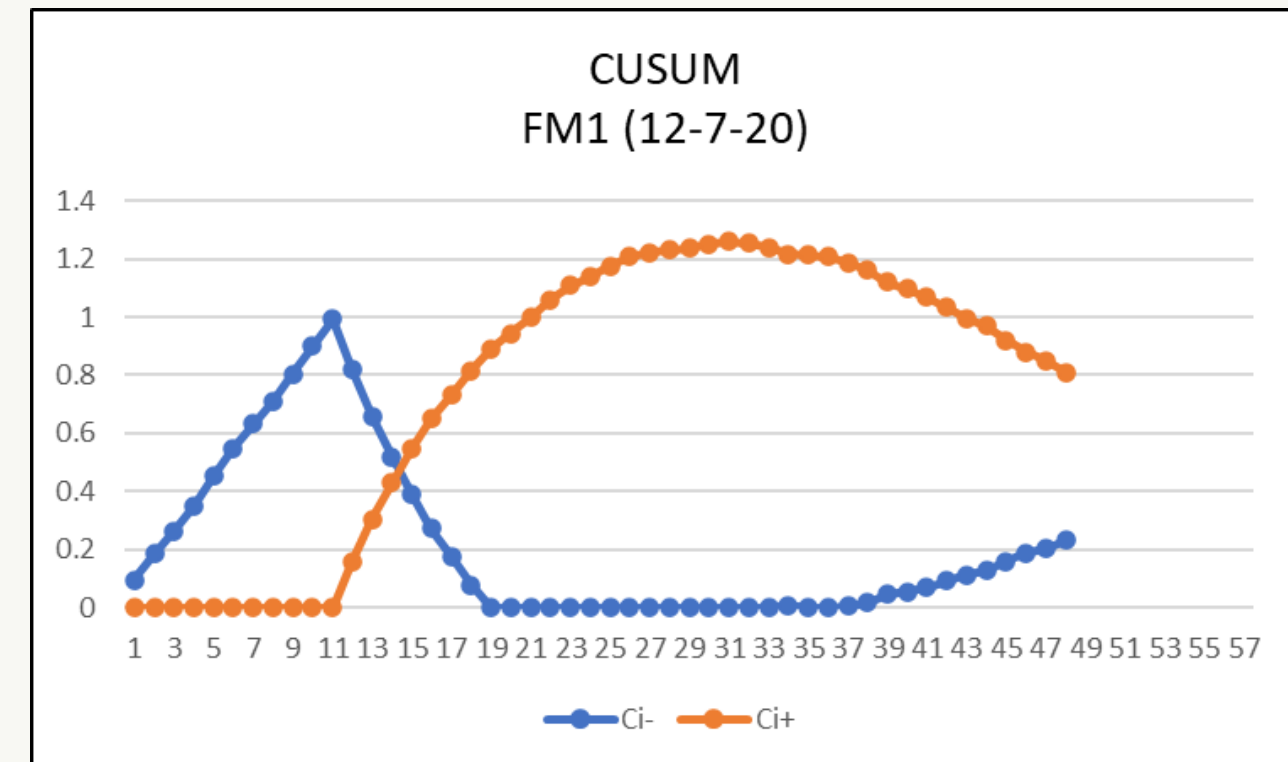
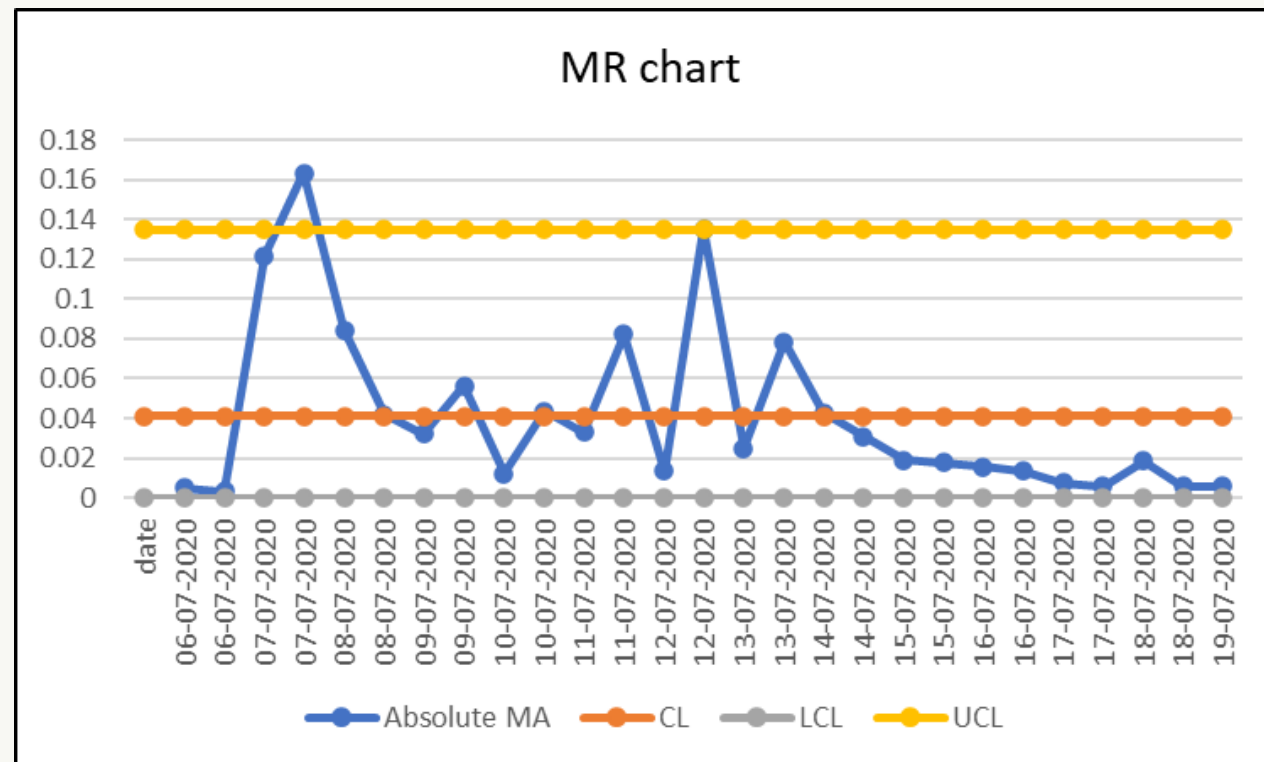
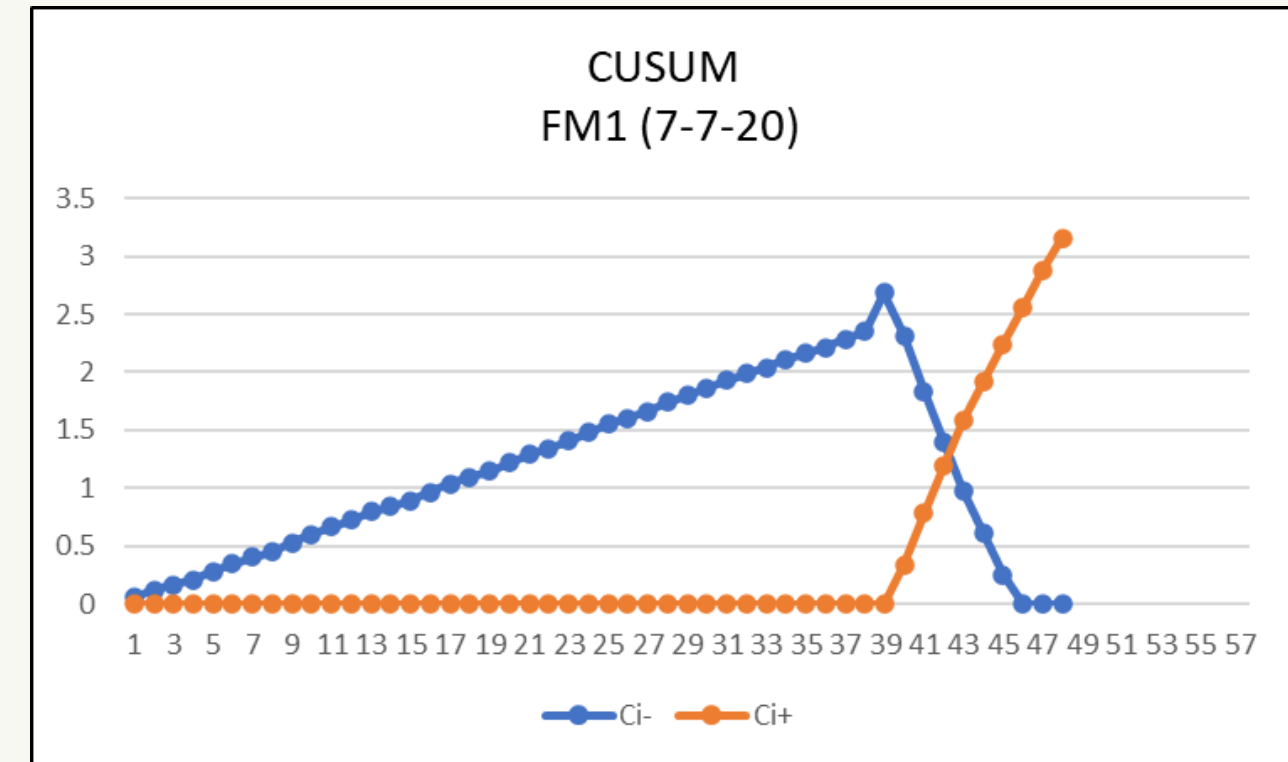
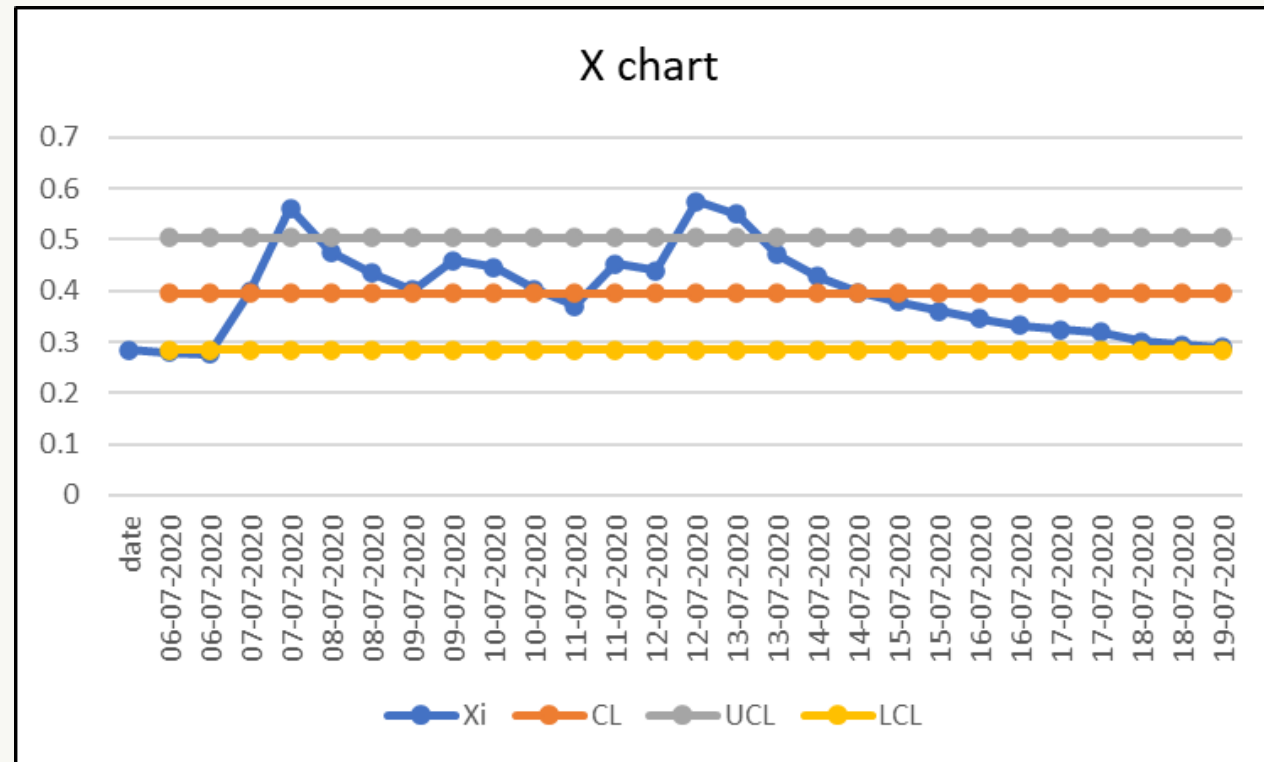
Interpretation: The MR chart shows that the process was out of control on the 6th of July. The process variation is not stable over time. From the cusum chart, a shift in the trend of the process was observed. Therefore the process mean has shifted, and the process may be affected by special causes.

PE2



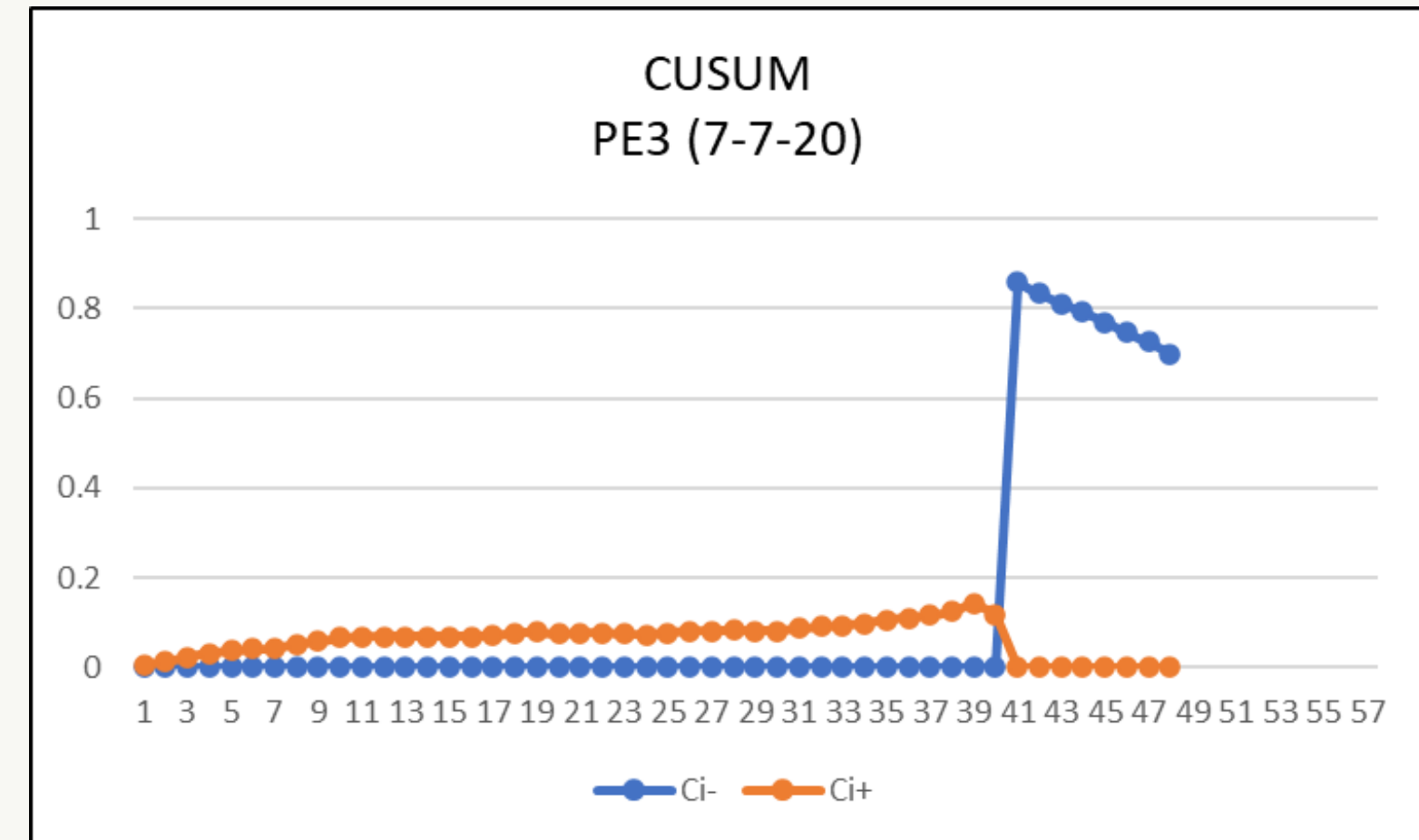
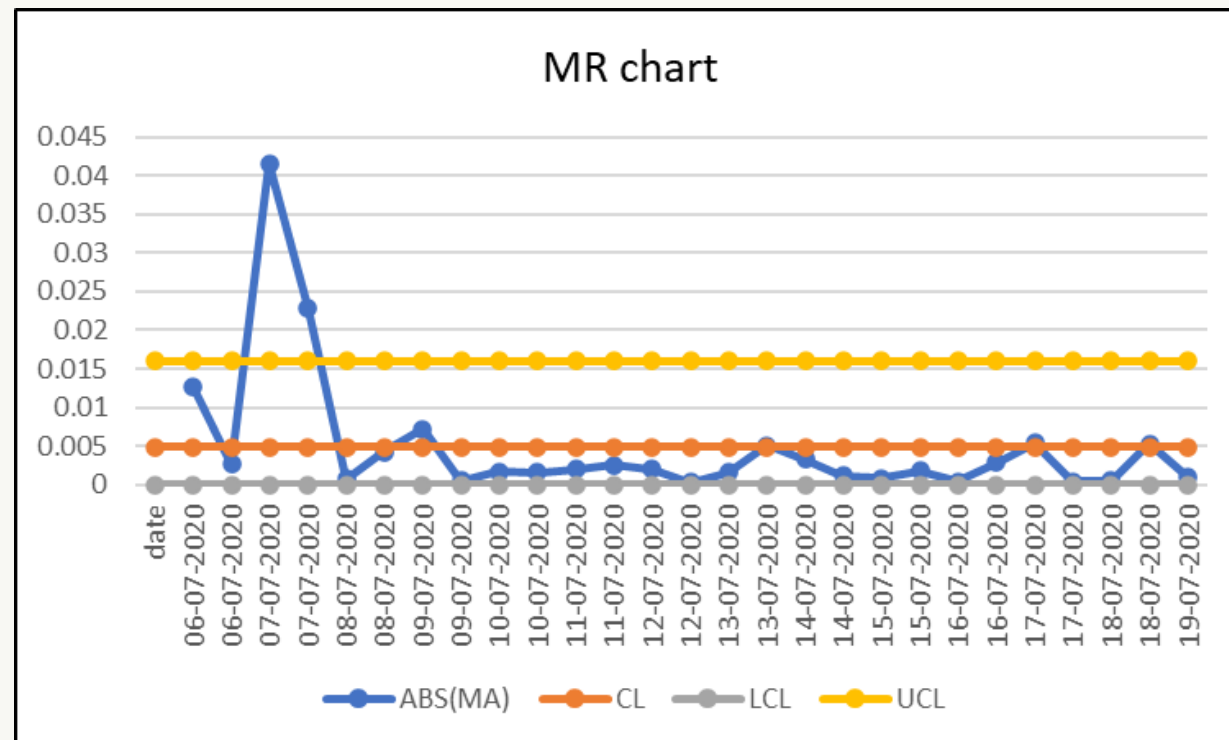
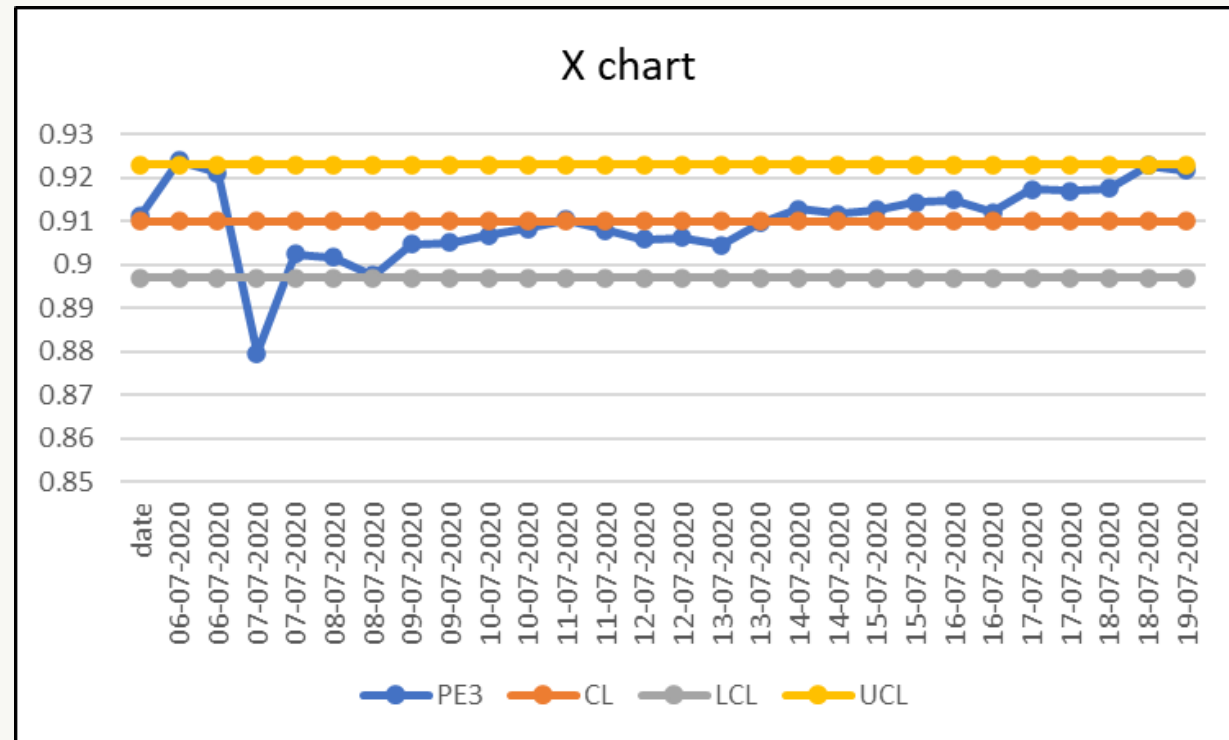
Interpretation: The X-MR chart shows that the process is out of control. The process variation is not stable over time. From the cusum chart, a shift in the trend of the process is observed for both days. Therefore the process mean has shifted, and the process may be affected by special causes.

FM1



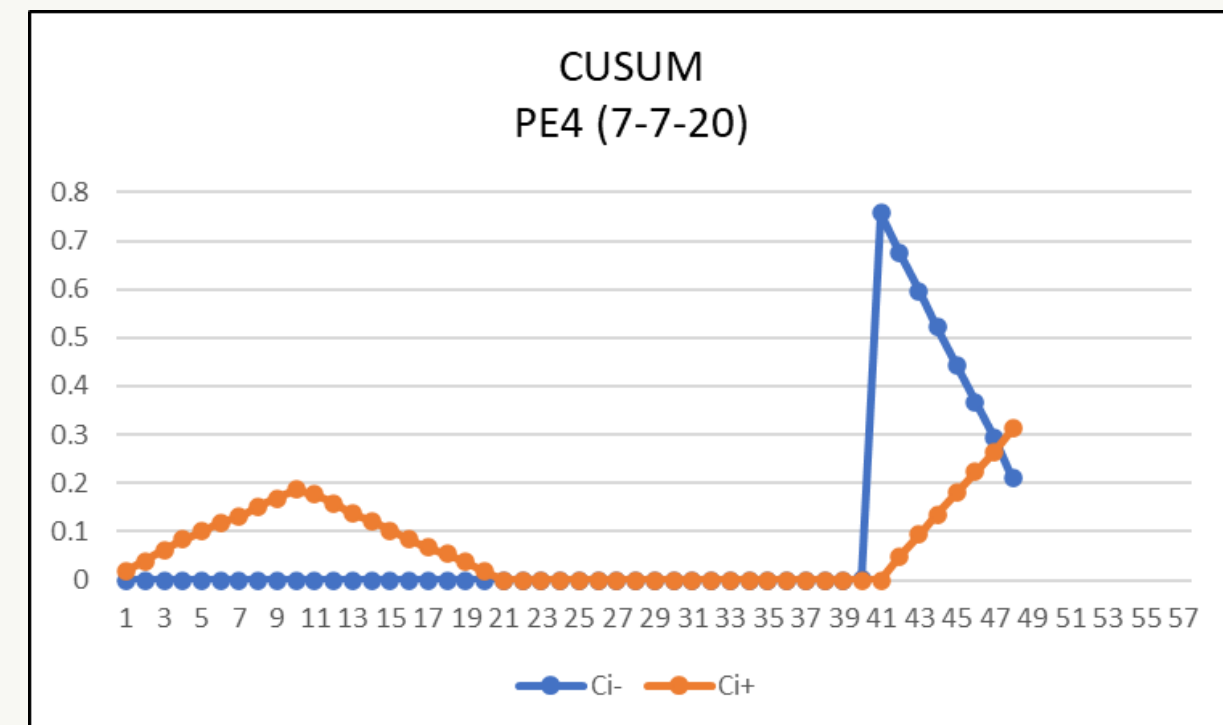
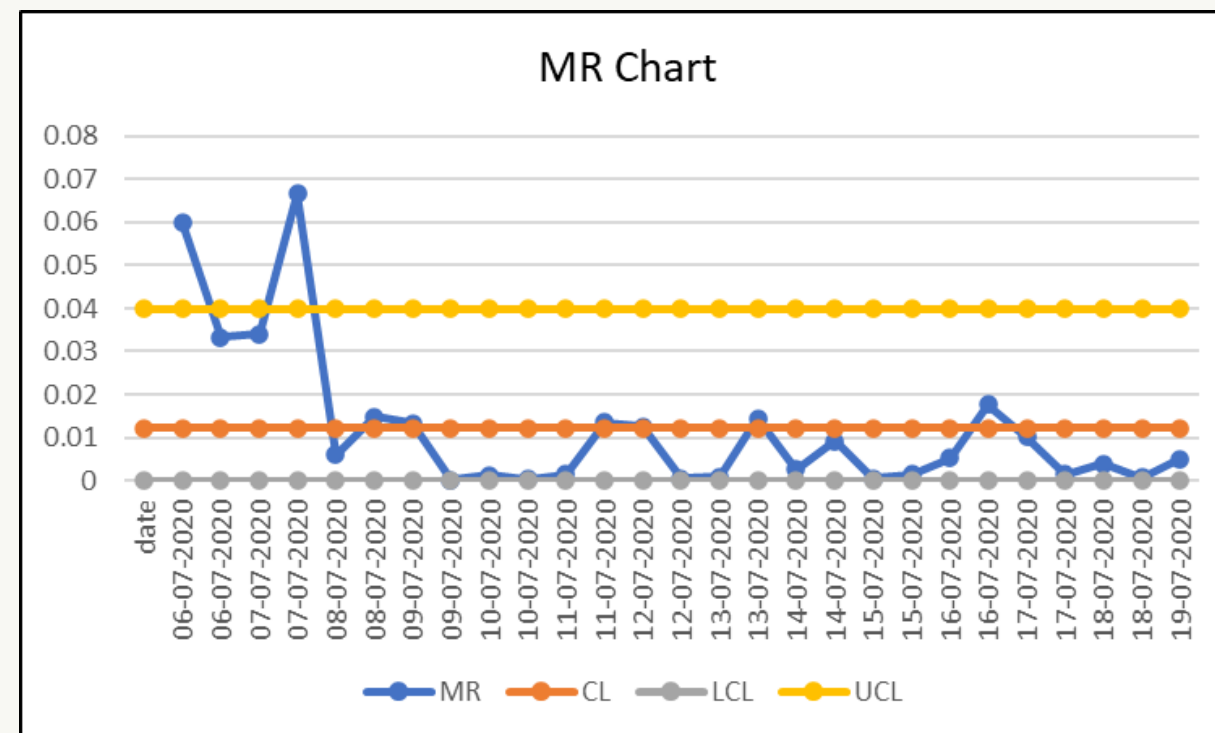
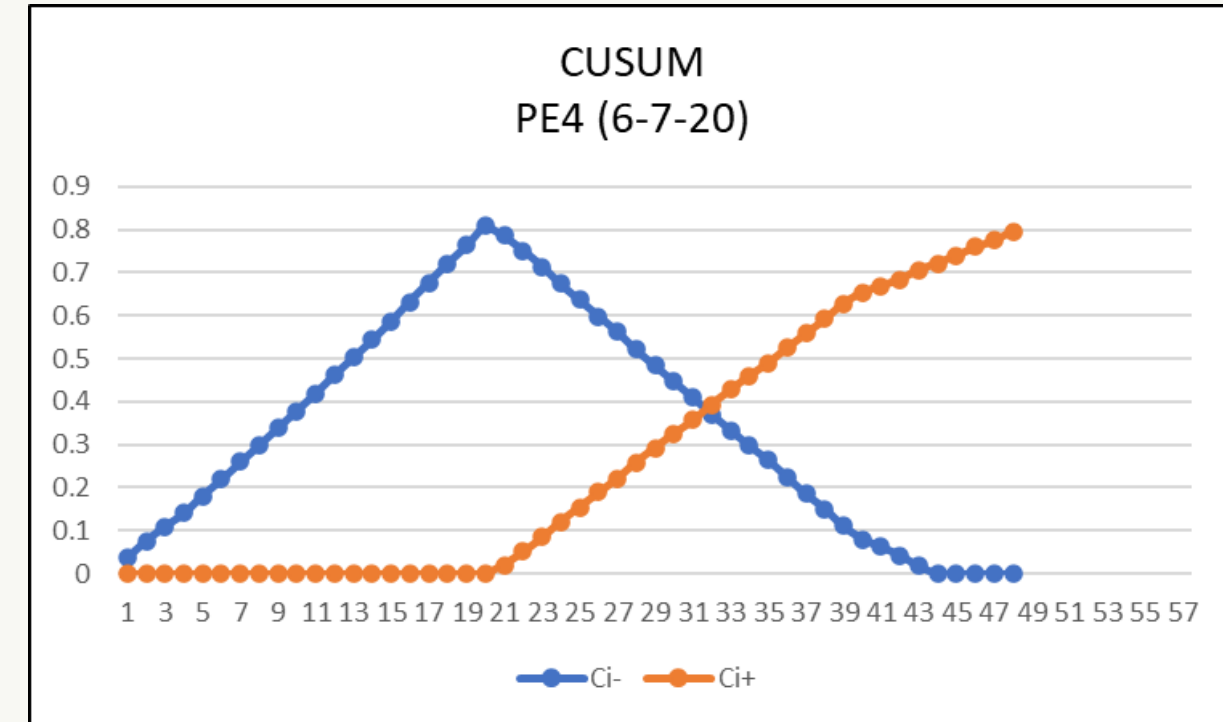
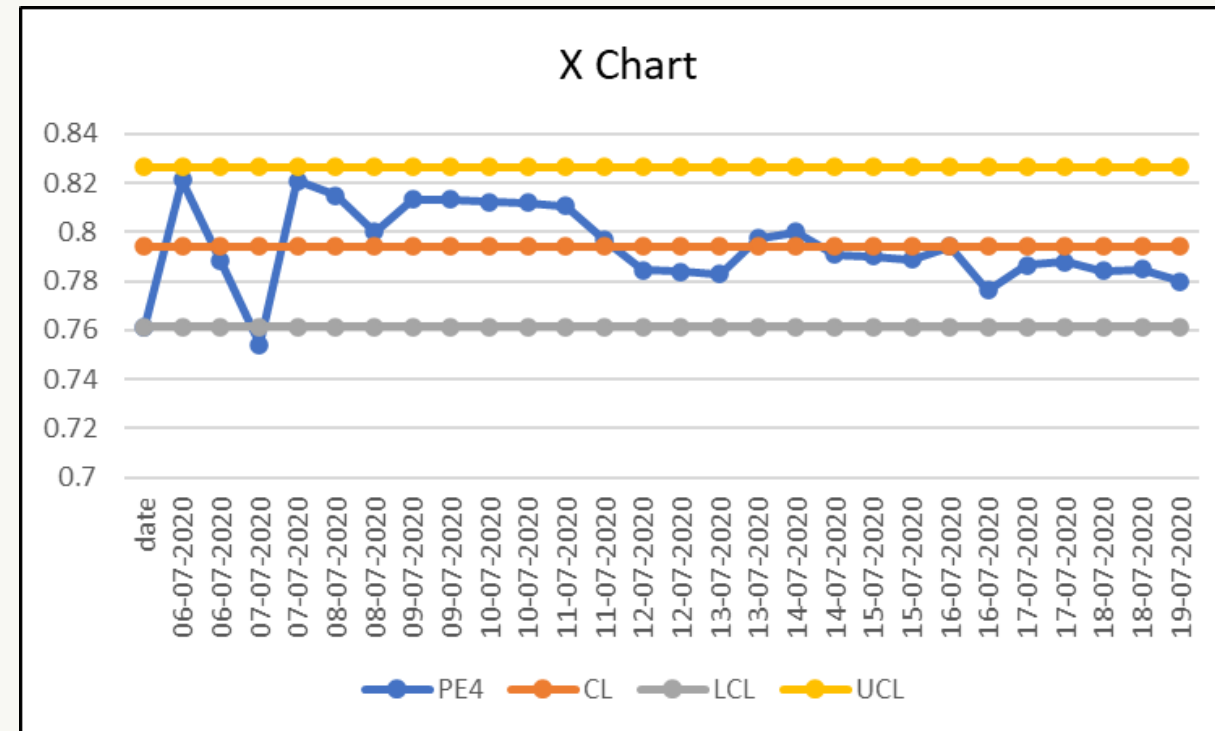
Interpretation: The process has been out of control according to the X-MR chart. Over time, the process variance is not stable. A change in the process' trend is seen on the cusum chart for two days. On July 12, a curve for the CUSUM chart is seen. As a result, the process mean has changed, and it could be impacted by special reasons.

PE3



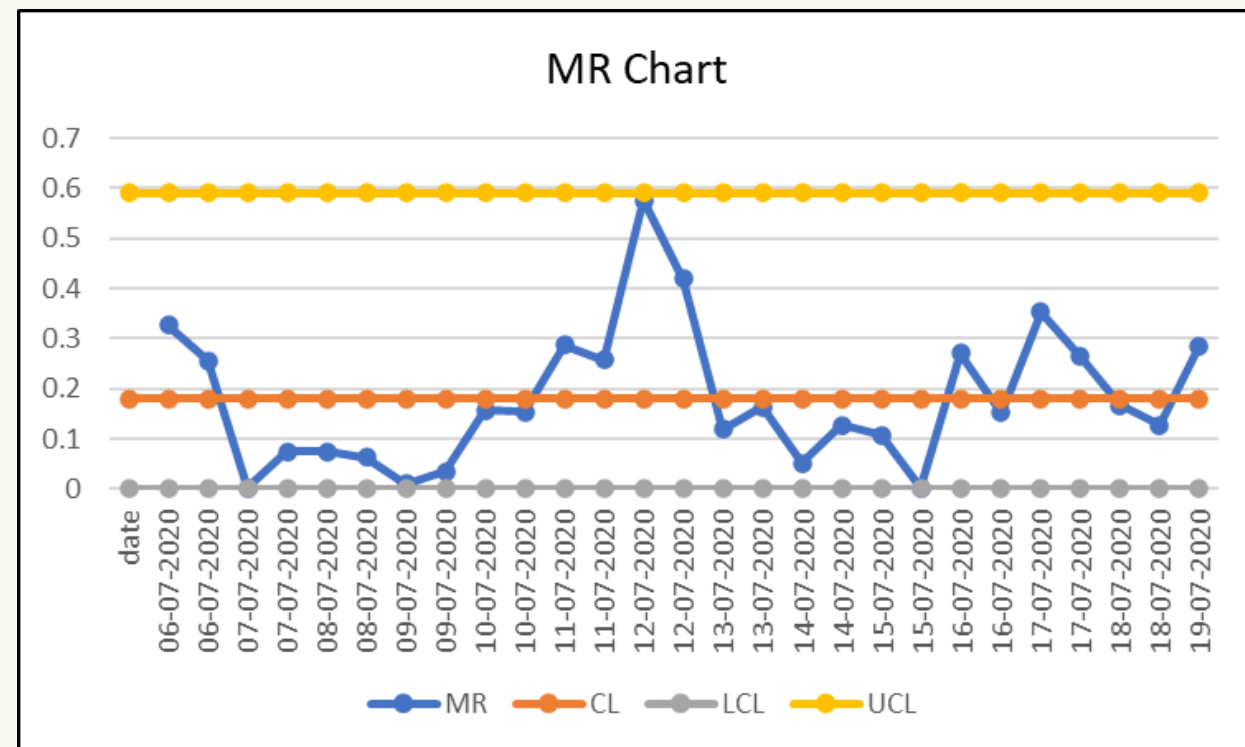
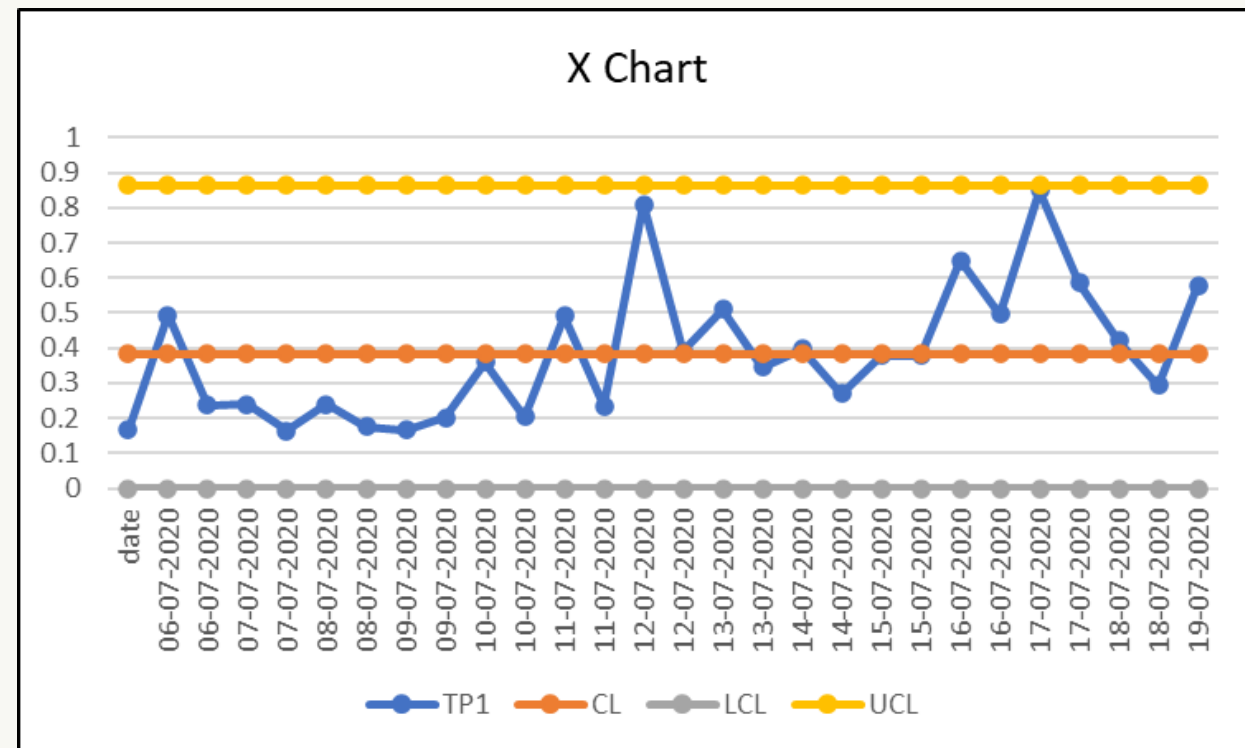
Interpretation: The X-MR chart shows that the process is out of control for a day. The process variation is not stable over time. From the cusum chart, a shift in the trend of the process is observed. Therefore the process mean has shifted, and the process may be affected by special causes.

PE4

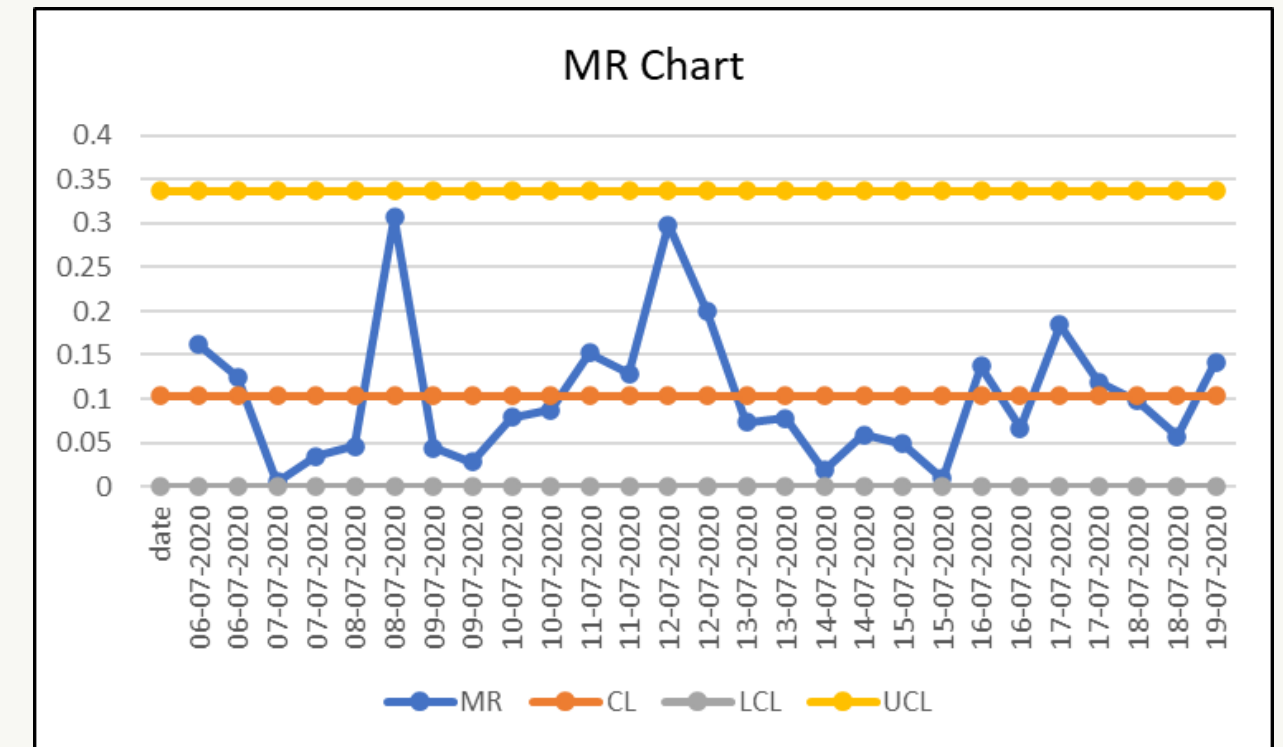
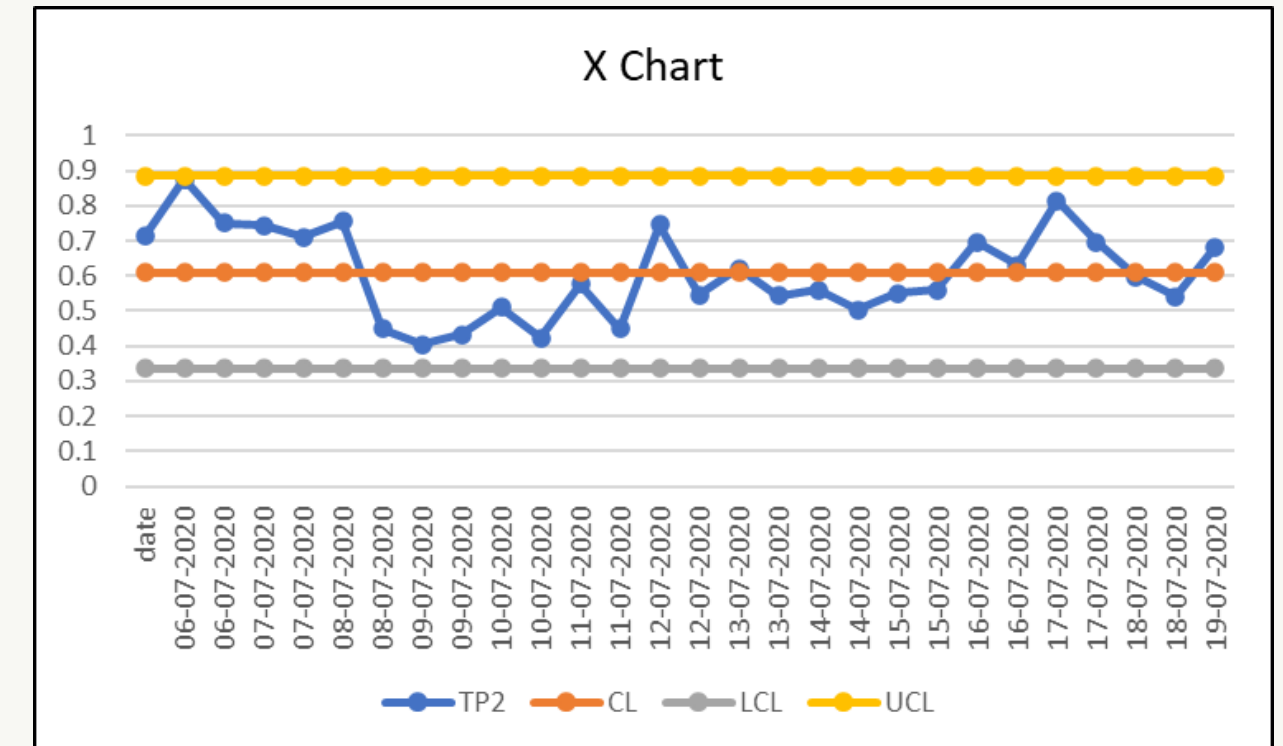


Interpretation: The MR chart shows that the process is out of control for two days. The process variation is not stable over time. From the cusum chart, a shift in the trend of the process is observed. Therefore the process mean has shifted, and the process may be affected by special causes.

TP1



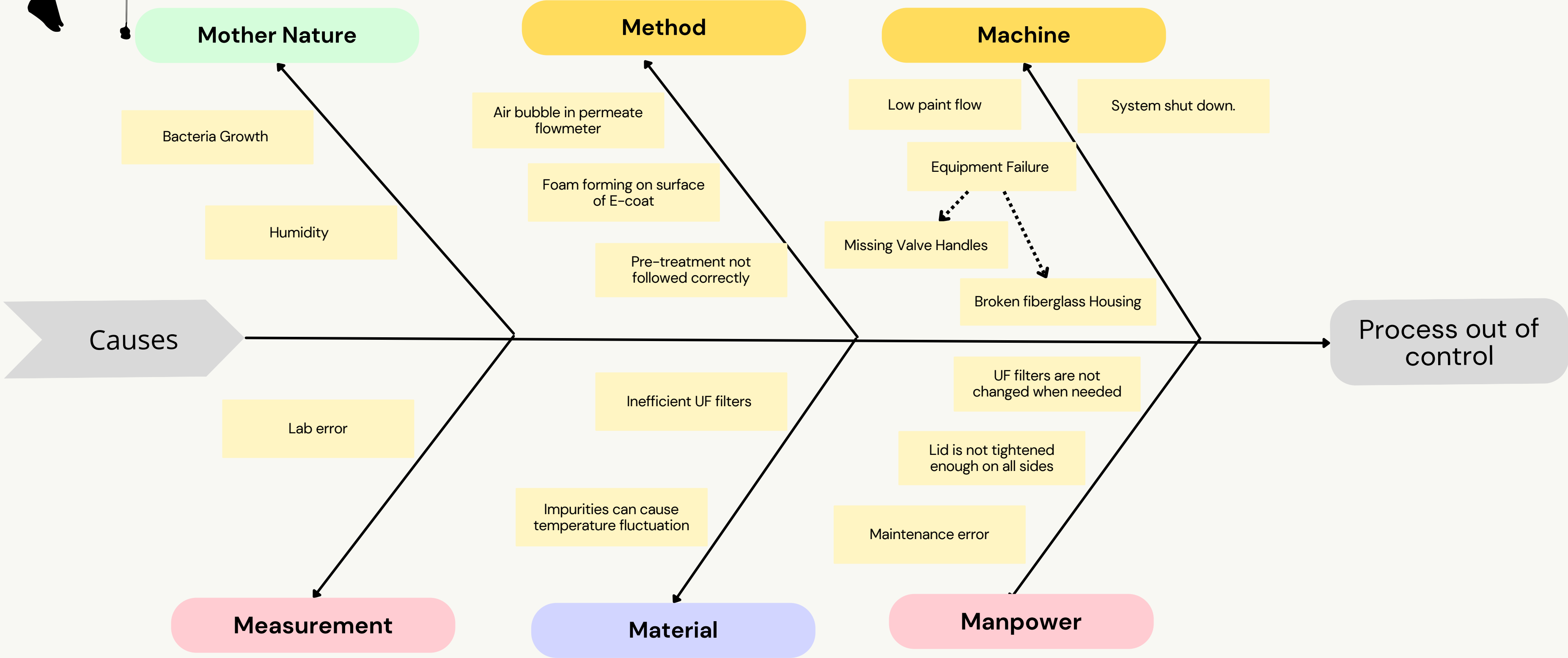
TP2



Interpretation: The X-MR chart for TP1 and TP2 both appear to lie within control limit. The control charts for TP1 shows a pattern. Hence we can't say that the process is in control. It can be inferred from X-MR chart for TP2 that the process is in control.



ISHIKAWA DIAGRAM



CONCLUSION

- The Control Charts on all variables show that the process is out of control.
- The CUSUM Chart plotted shows a shift in the process which may have been caused by special causes.
- The Ishikawa diagram describes the various causes that could impact the process.
- The data indicates that the procedure is highly variable.

*“ The business will sink in the hole,
if quality is not the goal ! ”*

RECOMMENDATIONS

- Semi-annual tank cleanings should be performed to check agitation, and weekly cleaning of the pump screens will prevent blockage.
- Regular testing to prevent maintenance error and operational issues.
- Maintenance tips: Change pre-filters.
- Employees need up-to-date training and orientation in operation and maintenance.
- Using clean, high-quality substrates and controlling pretreatment will minimize the non-uniformity of the cured electrocoat film.
- Double up: Be sure to use double mechanical pump seals, recommended for horizontal type centrifugal pumps.

THANK YOU!

गुणवत्ता से होगा ग्राहक समाधान
तो कभी न होगा आर्थिक नुकसान।

