College of Engineering

MIE 422: Group Case Study Report

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Executive Summary

Niche Foundry aims to evaluate whether its aluminium melt process complies with Integ Technologies' standards. This would ensure its position on the Approved Vendor List. The goal of this evaluation is to focus on an analysis of the melting process, process variation and supplier performance. This prepares Niche Foundry for its audit with Integ Tech and helps them identify areas for improvement.

The current melt process utilised depicts increased variability in key alloying elements of magnesium, titanium and silicon. These elements play a crucial role in the final quality of the cast parts. There are also inconsistencies in the melt process due to operator dependant methods and narrow specification margins. This has resulted in a 32.82% out-of-specification rate in the castings from 2019. This reflects poorly on Niche Foundry's ability to keep up with strict quality standards that are demanded by high-profile clients such as Integ Technologies.

To reduce such inconsistencies, Niche Foundry should integrate real-time control charts into its melt process. Integrating X-bar and R charts can help monitor melt composition and signal warnings of out-of-spec samples early on. Using automated calculations can help minimize operator variability in data. Furthermore, if spectrometer testing was used after the cooling stage instead of the cutoff stage, it would allow for remedial action to be taken much earlier, which would in turn decrease scrap rates and increase process efficiency.

These enhancements would align with the expectations of Integ Tech and would help Niche Foundry pave the way to the Approved Vendor List.

Assessment of Melting Process Stability and Capability

To identify if Niche's melting process is both stable and capable, we need to examine two charts: Control Chart and Process Capability Charts.

Process Capability is calculated as described in Appendix J.

Capability Report

Variable	Lower Specification Limit	Upper Specification Limit	Cp	Estimated % Outside Specification
CU	0	0.18	3.3018	8.7447
SI	6.5	7.5	1.0914	0.1071
FE	0	0.15	3.0049	0.0000
MN	0	0.1	4.6843	21.2136
MG	0.25	0.45	0.8025	1.6106
ZN	0	0.1	5.8551	0.1560
NI	0	0.05	4.8403	0.0135
PB	0	0.05	Cannot calculate	Cannot calculate
SN	0	0.05	70.6824	0.0000
TI	0.1	0.2	0.9244	0.9875
CR	0	0.05	Cannot calculate	Cannot calculate
BE	0	0.05	71.9507	0.0000
OTHER	0	0.15	14.3830	0.0000

Figure 1. Capability report of all materials composition

Here we can see that for the composition of Magnesium (Mg) and Titanium (Ti), the process capability is below 1, therefore they're unable to meet their desired specifications consistently. In addition, Silicon (Si) has a Cp value of 1.09, which, although it is within the specification range, is highly susceptible to any process changing its process mean to fall out of the specification range. Lead (Pb) and Chromium (Cr) do not have calculated Cp value as all samples measured were 0, thus they have no spread and are fully in the spec range. Failure of these two materials based on Niche's spec sheets and the Aluminum standards (Appendix B) means the melting process is not fully capable.

To determine whether Niche's melting process is stable, we'll examine its samples through an X-R graph. Multiple spectrometer readings of the materials show variations beyond the 3-Sigma limit in a series, indicating an out of control process. This showcases that the process is not fully stable. Detailed showing of the graph can be seen in the Appendix section.

Identification of Key Process Indicators (KPIs)

The key process indicators (KPIs) for the melt process to ensure Niche Foundry's melt process is stable, capable and satisfy Integ Technologies's requirement by monitoring and reporting during the supplied audit. These KPIs focus on evaluating composition percentage of both the melt process and the quality of the raw material of each element to ensure within specifications limit as shown in Appendix C and B. The elements are identified as Silicone(Si), Iron(Fe), Copper(Cu), Manganese(Mn), Magnesium (Mg), Zinc(Zn) and Titanium(Ti). Niche Foundry should focus on monitoring and controlling the element Mg, Ti and Fe in their melt process which each impacts chemical composition control and final casting quality as shown in Appendix A. Niche should maintain these elements within their specified ranges to minimize defects in final castings.

Application of Process Control Charts

After using the capability index, we know the elements Mg, Ti and Si need further investigation by using a control chart. We referencing the X-bar charts for daily melt composition as Appendix F shown and Niche Foundry's melt specifications as Appendix C shown. Data is sampled by the given inspection date and given a maximum subgroup size of 6 based on assumptions made in Appendix E.

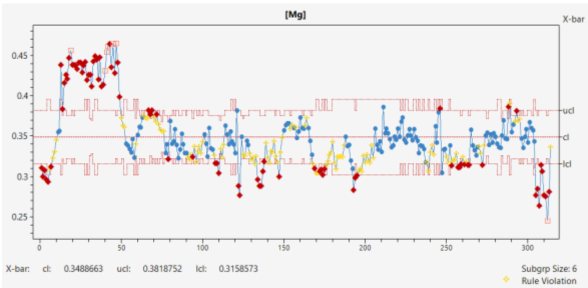


Figure 2: X-bar chart of melt composition Mg

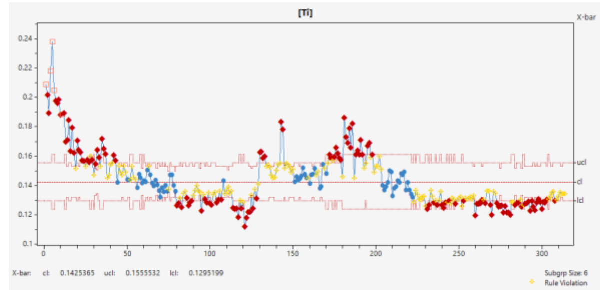


Figure 3: X-bar chart of melt composition Ti

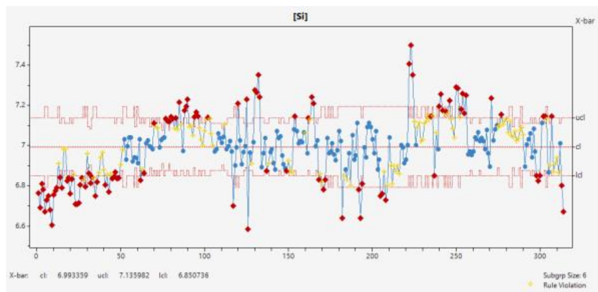


Figure 4: X-bar chart of melt composition Si.

Since most data points from the R chart have most of the data points in the control, we can focus on analyzing the X-bar chart. As shown in figure 2,3 and 4, the control charts show some data points that are out of control from the early days in element Mg, Ti and Si. The trends become more stable for all three elements over time. However, Mg and Si have only some random out of control points, Si shows most of the data points around the control limit line. The melting process is out of control due to the furnace operators' lack of experience so Niche Foundry should improve the furnace operators' performance to improve the target value.

Evaluation of Raw Material Supplier Performance

To check if the supplier of the raw material is capable of meeting Niche's specifications by using the capability index. The supplied ingots need to meet the requirement as Appendix B shown. The capability report shows that the supplier is generally capable for most elements but some elements require attention as shown in figure 5. The elements such as Si , Fe , Mg and Ti show strong process capability with very low estimated out of spec rates ensuring they meet Niche's requirement.

Capability Report

Variable	Lower Specification Limit	Upper Specification Limit	Cp	Estimated % Outside Specification
SI	6.5	7.5	1.3280	0.0098
FE	0	0.2	3.5363	0.0000
CU	0	0.2	1.4745	28.0058
MN	0	0.1	3.7783	37.7259
MG	0.25	0.45	1.6744	0.0205
ZN	0	0.1	4.0388	34.7258
TI	0	0.2	3.7724	0.0000

Figure 5: Capability index of the raw material composition.

While the element Mn, Zn and Cu are highly capable with high estimated out of spec percentages likely the targets are near to the lower specification limit which is zero as the Appendix G showed. To ensure full supplier capability, Niche Foundry should first adjust the target value for the element Manganese (MN), Zinc (Zn) and copper (Cu). In addition, all sampled materials are stable with few variations beyond the 3 Sigma limit. Overall, the supplier's performance is capable for all elements but targeted improvements are important to achieve full requirements across all specifications.

Analysis of Out-of-Specification Production in 2019

The casting on the line in 2019 has a sum of 32.82% of all the casting produced at Niche Foundry outside specification limits from the capability report in the figure 1. The element manganese (Mn) has the most high fail rate of all elements which is 21.21% and copper (Cu) has 8.74% which these two elements are the main reason for high rate defects of all the casting produced. Magnesium (Mg) and titanium (Ti) have around 1% out of specification rates which are low but they still need to be monitored due to their mechanical properties and heat treatment. Elements like Fe, Zn, Ni and others had nearest zero or zero defects rate which shows better control. Since the overall defect rate is high, Niche Foundry should focus on improving control for the key elements Mn and Cu and identify the root causes such as operator practices or furnace performance.

Root Cause Analysis of Melt Control Issues

Based on the control charts in Appendix F and H, it can be determined that variability in Niche Foundry's melting process is caused primarily by the material and partially by the method utilized in the process.

The X-bar and R charts and X-bar and MR charts display the variation in the melt composition of the seven elements: Si, Fe, Cu, Mn, Mg, Zn, and Ti. To evaluate the stability of the melting process, we can analyse the behavior of the key alloying elements: Magnesium (Mg), Titanium (Ti), and Silicon (Si). These three elements are crucial as, in accordance with Appendix A, each one of them plays a critical role in the mechanical strength, castability and surface finish. Magnesium and titanium are specifically added to enhance mechanical properties and silicon is the main structural alloying element of A356.2 aluminum. All of these elements play a deciding role in the final quality of the product.

The charts for magnesium show a few data points in the beginning to be outside the control limits. This could be an indication of a special cause of variation in the early samples. However, as the process goes on, the data points are within control limits and do not exhibit any unexpected patterns, which conveys that the process becomes more stable over time. A similar pattern can be observed in Titanium, with some variability in the earlier data points, but there are substantially lesser anomalies as the process progresses, which shows us overall improvement in stability. The charts for silicon show relatively the most points lying within the control limits; however, various points can be seen to be hovering quite close to the upper control limit. This

shows that, while silicon is under control, it is too close to its specification boundary, which makes it highly vulnerable to even small discrepancies. This goes to show that there is significant instability in the composition of the alloy, which is not suitable for high-precision usage.
In addition to this, the method used for the melting process can be a cause of further variability. In the casting process, it is stated that furnace operators estimate how much metal was removed from the previous batch to calculate how much magnesium and titanium they add to the current batch. These estimations make this method human-dependent. This part of the process depends on operator to operator, and each operator makes manual calculations to compute the amount of return metal and additions. The out-of-control data points in the early sampling period of the X-bar and R charts of magnesium and titanium could be due to this step in the process. These fluctuations indicate an inconsistency in the control of the process. A similar thing can be observed with silicon and iron, as their points hover close to the specification limits, thus even small fluctuations in operator misjudgements can have a big impact.

Continuous Improvement Framework for Melt Process

There are a few possibilities for Niche to improve its framework that we can think of in the melting process. Training furnace operators could help improve the process but it requires both time and financial investment. Niche could use the spectrometer to measure melt composition immediately after the cooling stage rather than after the cutoff stage as shown in Appendix C. With this information earlier, the cutoff process can be adjusted more accurately to remove the amount ratio of material to ensure only nonconforming portions are recycled while minimizing unnecessary waste.

Recommendations for Future Data Collection and Process Monitoring

1. Adding weight/dimensions measurements

   This helps operators know how much material needs to be added before remelting. Improving the human factor in the melting process

2. Create warning limits in the melting process and in samples of raw materials

   By setting control limits closer to the specification boundaries, Niche can detect trends and shifts in melt composition before they result in out of specification conditions. These warning limits would allow operators to take quick action in real time to improve process stability and rework rates

3. Consistent number of samples at more consistent time frame

   Niche's inconsistent sampling numbers mean inconsistent control line values which complicates process control. Consulting the X-R melt charts shows that many of these collected values might suffer from Type I errors due to shifting control lines caused by low inconsistent sampling amounts. The time frame between samplings can also be improved, inconsistent gaps between sampling the melt chemistry and the supplier chemistry means Niche cannot create proper corrective actions or have appropriate warning limits. They also can't troubleshoot out of spec batches to make improvements.

   These 3 improvements might provide a better process and increase the quality of Niche's castings.

Appendix

Appendix A: Material Information.

A356 Aluminum Alloy

Cast A356 Aluminum Alloy offers attractive combinations of excellent castability and good weldability, pressure tightness, and good resistance to corrosion. It can be used for aircraft pump parts, automotive transmission cases, aircraft fittings and control parts, water cooled cylinder blocks, aircraft structures and engine controls, nuclear energy installations, and other applications where high strength castings are required. However, in severe service circumstances like those in mining and rolling sectors, the low hardness and poor wear resistance limit its further industrial applications.

Magnesium Additions

The addition of magnesium allows the castings to be heat treated which hardens the alloy and impart specific combinations of strength and ductility. Alloys containing between 0.05% to 0.3% magnesium seem to suffer from fewer porosity defects.

Titanium Additions

Titanium is added to aluminum primarily as a grain refiner. Grain refinement ensures a more even distribution of properties, is supposed to enhance the resistance to hot tearing, improves the feedability of the melt during solidification, and improves the surface response to finishing operations such as polishing and anodizing. The grain refining effect of titanium is enhanced if boron is present in the melt or if it is added as a master alloy containing boron largely combined as TiB_2

Iron Impurities

Iron is the most common impurity in aluminum and its alloys and is not easily removed. It solidifies into a number of brittle phases from the eutectic liquid, and it can cause adverse effects to ductility and castability, particularly in the popular Al-Si based casting alloys such as A356.2 Iron can be introduced to the aluminum material stream through the recycling process (scrap yards), and in the casting process when using uncoated ladles during metal transfer.

Appendix B: Aluminum Association Chemical Composition Standard.

Standards For Aluminum Sand and Permanent Mold Castings

METALLURGICAL SERIES (M)

M2*
CHEMICAL COMPOSITION LIMITS

TABLE 2: CHEMICAL COMPOSITION LIMITS FOR COMMONLY USED SAND AND PERMANENT MOLD CASTING ALLOYS ①②

DESIGNATION		PRODUCTS⑥	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Pb	Sn	Zr		FNs	OTHERS⑦		Al
AA No.	DATE REGISTERED																		Each	Total③	
201.0	1968-04-17	S	0.10	0.15	4.0-5.2	0.20-0.50	0.15-0.55	...	...	...	0.15-0.35	0.40-1.0	...	...	...	...	...	...	0.05	0.10	Rem.
204.0	1974-10-01	S&P	0.20	0.35	4.2-5.0	0.10	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...	...	...	0.05	0.15	Rem.
206.0	1976-04-23	S&P	0.10	0.15	4.2-5.0	0.20-0.50	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...	...	...	0.05	0.15	Rem.
A206.0	1976-04-23	S&P	0.05	0.10	4.2-5.0	0.20-0.50	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...	...	...	0.05	0.15	Rem.
242.0	....	S&P	0.7	1.0	3.5-4.5	0.35	1.2-1.8	0.25	1.7-2.3	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
295.0	....	S	0.7-1.5	1.0	4.0-5.0	0.35	0.03	...	...	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
296.0	....	P	2.0-3.0	1.2	4.0-5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	...	...	...	...	...	...	0.35	Rem.
308.0	....	S&P	5.0-6.0	1.0	4.0-5.0	0.50	0.10	...	...	1.0	0.25	...	...	...	...	...	...	...	...	0.50	Rem.
319.0	....	S&P	5.5-6.5	1.0	3.0-4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	...	...	...	...	...	...	0.50	Rem.
328.0	2003-07-09	S	7.5-8.5	1.0	1.0-2.0	0.20-0.6	0.20-0.6	0.35	0.25	1.5	0.25	...	...	...	...	...	...	...	...	0.50	Rem.
332.0	....	P	8.5-10.5	1.2	2.0-4.0	0.50	0.50-1.5	...	0.50	1.0	0.25	...	...	...	...	...	...	...	...	0.50	Rem.
333.0	....	P	8.0-10.0	1.0	3.0-4.0	0.50	0.05-0.50	...	0.50	1.0	0.25	...	...	...	...	...	...	...	...	0.50	Rem.
336.0	....	P	11.0-13.0	1.2	0.50-1.5	0.35	0.7-1.3	...	2.0-3.0	0.35	0.25	...	...	...	...	...	...	...	0.05	...	Rem.
354.0	....	P	8.6-9.4	0.20	1.6-2.0	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
355.0	....	S&P	4.5-5.5	0.6[8]	1.0-1.5	0.50[7]	0.40-0.6	0.25	...	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
C355.0	....	S&P	4.5-5.5	0.20	1.0-1.5	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
356.0	....	S&P	6.5-7.5	0.6[8]	0.25	0.35[7]	0.20-0.45	...	...	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
A356.0	....	S&P	6.5-7.5	0.20	0.20	0.10	0.25-0.45	...	...	0.10	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
B356.0	1981-09-17	S&P	6.5-7.5	0.09	0.05	0.05	0.25-0.45	...	...	0.05	0.04-0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
357.0	....	S&P	6.5-7.5	0.15	0.05	0.03	0.45-0.6	...	...	0.05	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.

Appendix C: Niche Foundry Melt Specification.

Niche Foundry **712 Alloy Ave** **Bauxite, UT 86753**	**IN PROCESS MATERIAL SPECIFICATION:** **A356.2 MELT**	**Document #:** **Revision:** **Effective:** **Page:**	**WIP-SP-011** **01** **01/21/20** **5 of 5**

CHEMICAL COMPOSITION LIMITS
(Range or maximum)

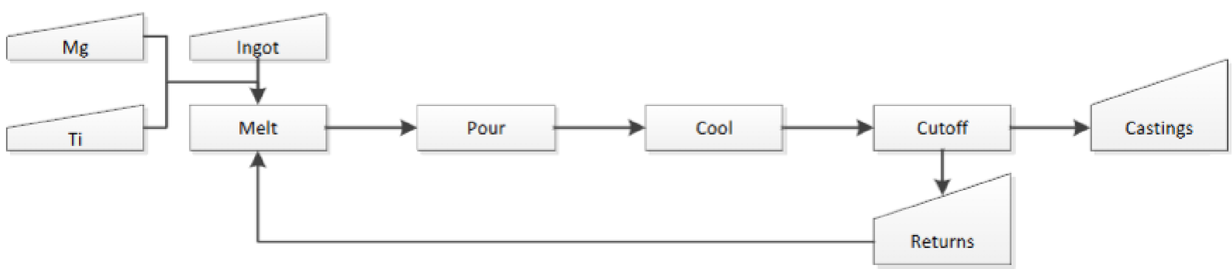
Plant	Alloy *Trade name*	Si	Fe	Cu	Mn	Mg	Zn	Ti	Others		Al
									Each	Total	Balance
01	**A356.2**	6.5 – 7.5	0.15†	0.18†	0.10	0.25 – 0.45	0.10	0.10 – 0.20†	0.05	0.15	Balance

† Indicates variation from Aluminum Association standard chemical composition limits (AA-CS-M2-84)

Revision History:

Revision	Description of Change(s)	Effective Date
00	Initial release	07/14/14
01	Removed Ni & Pb concentration level	01/21/20

Appendix D: Casting process and material flow chart.



Appendix E: Assumption.

Data measurement processes are accurate and precise

The case study mentions daily spectrometer tests but does not include the calibration or measurement error. If spectrometers' accuracy drift, the data from KPIs could be unreliable. For the sake of simplicity we'll assume that the

Every Furnace is sampled once per day and that there are 6 furnaces

Within the data we are shown multiple furnaces can be examined per day, given that we never see any repeated furnace number on the same day, we'll assume for our analysis that Niche samples the chosen furnace once per day. Since the highest furnace number is 6 we'll also assume the most number of furnaces sampled per day (max subgroup) will be 6.

Appendix F: X and R chart for seven elements' melt composition.

Parameter choice and graph decisions.

All X - R charts are generated using NWA QA software using the SAMPLE DATE to determine mean when necessary, The maximum subgroup size is 6 based on assumptions made in Appendix E. The following pattern rules are chosen

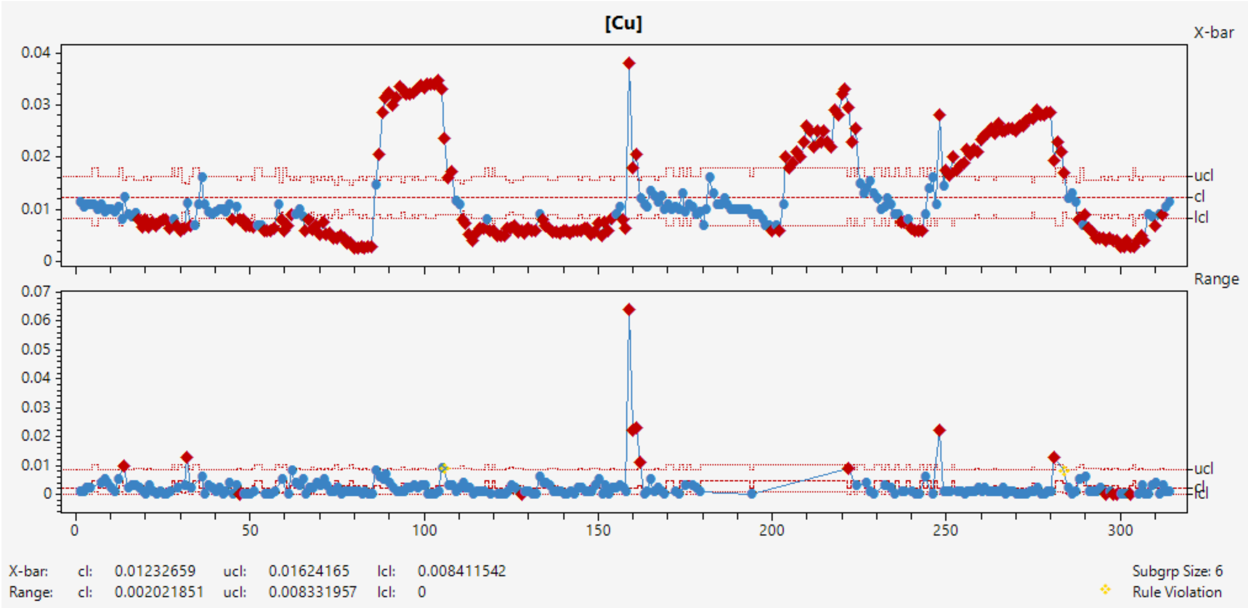
Materials with upper limit spec only: Zone Rule "4 of 5 above ⅓ of UCL" Run Rule "6 increasing"

This was chosen as since the element only has a max value, any trend of decreasing mean is ideal and doesn't have to trigger a warning, an increasing trend would indicate a process about to go out of control so it is kept. Run rules is chosen as 6 increasing as it is the most sensitive and also tracks our main point of concern, increasing trend that might exceed the spec limit.

Materials with both upper and lower spec limit: Zone Rule "4 of 5 above ⅓ of UCL" and "4 of 5 below 1/3 of LCL" Run rule "6 increasing" and "6 decreasing"

These materials have both an upper and lower limit so the zone rule applies to both side of the control chart along with both run rule of 6 increasing and 6 decreasing to detect shifts.

Cu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ucl
cl
lcl
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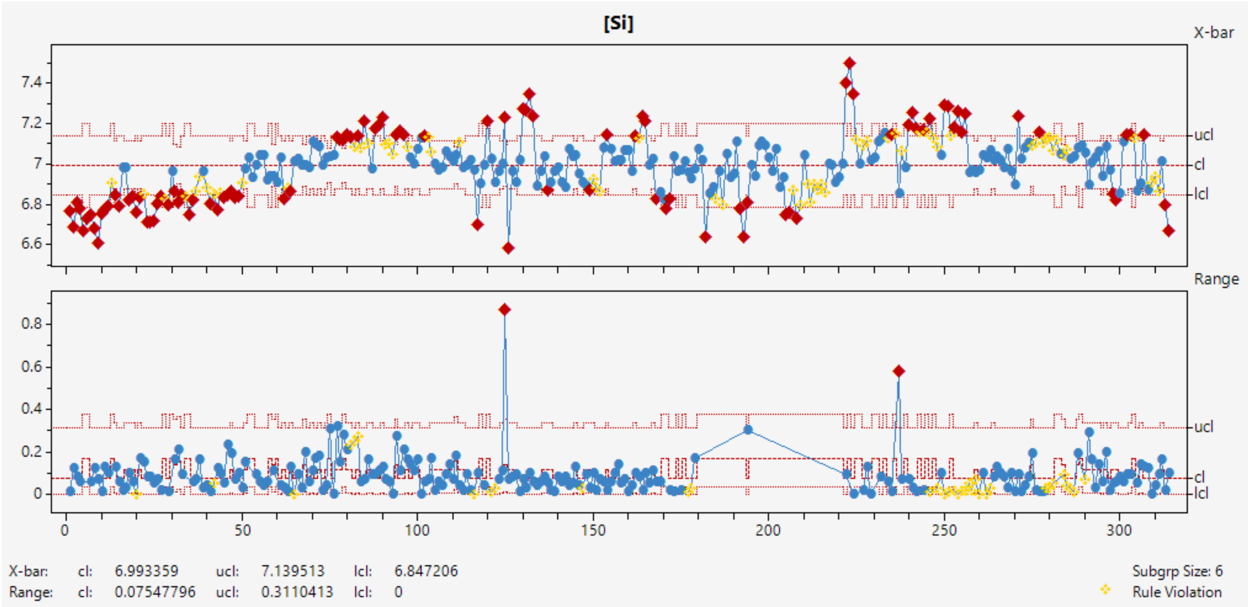
Rule Violation

Si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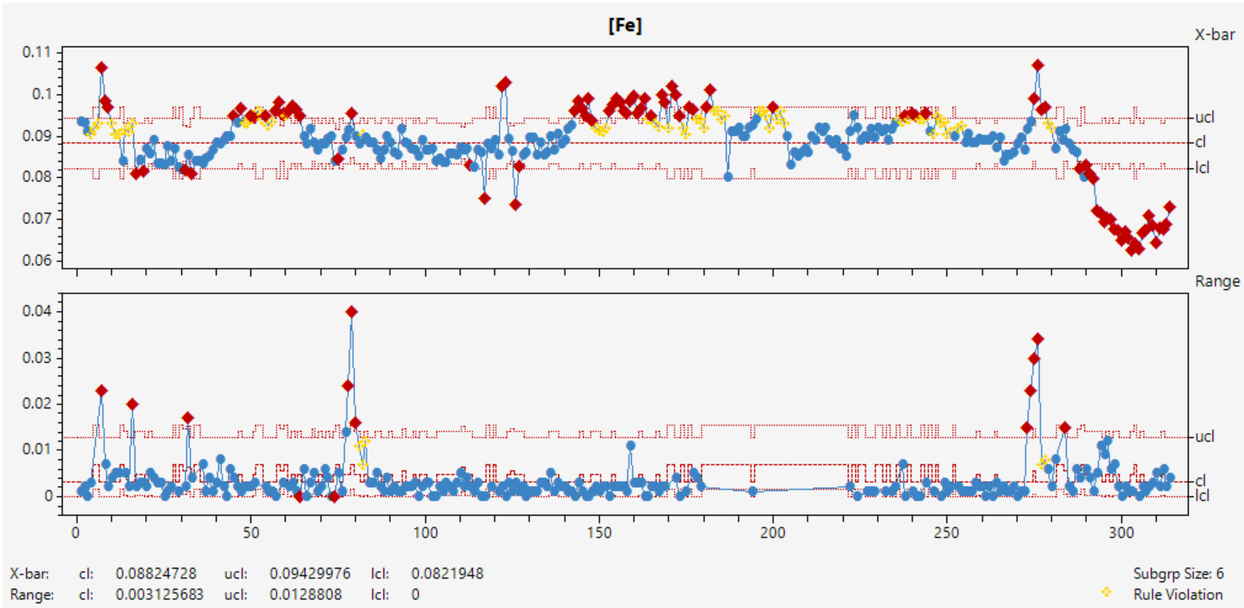
Fe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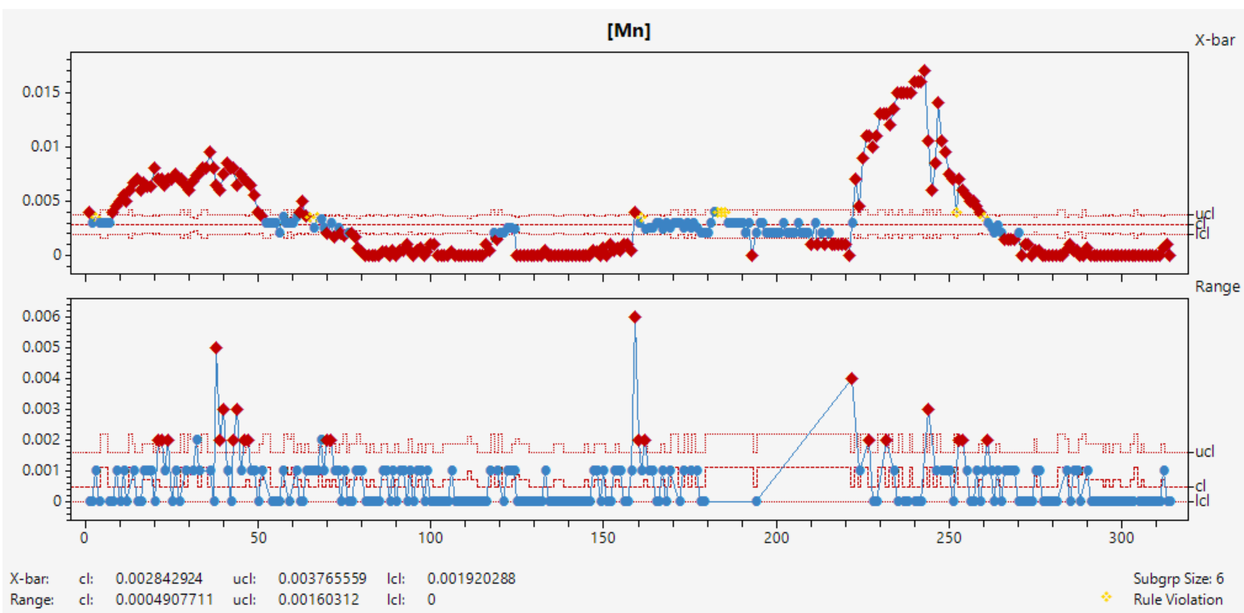
Mn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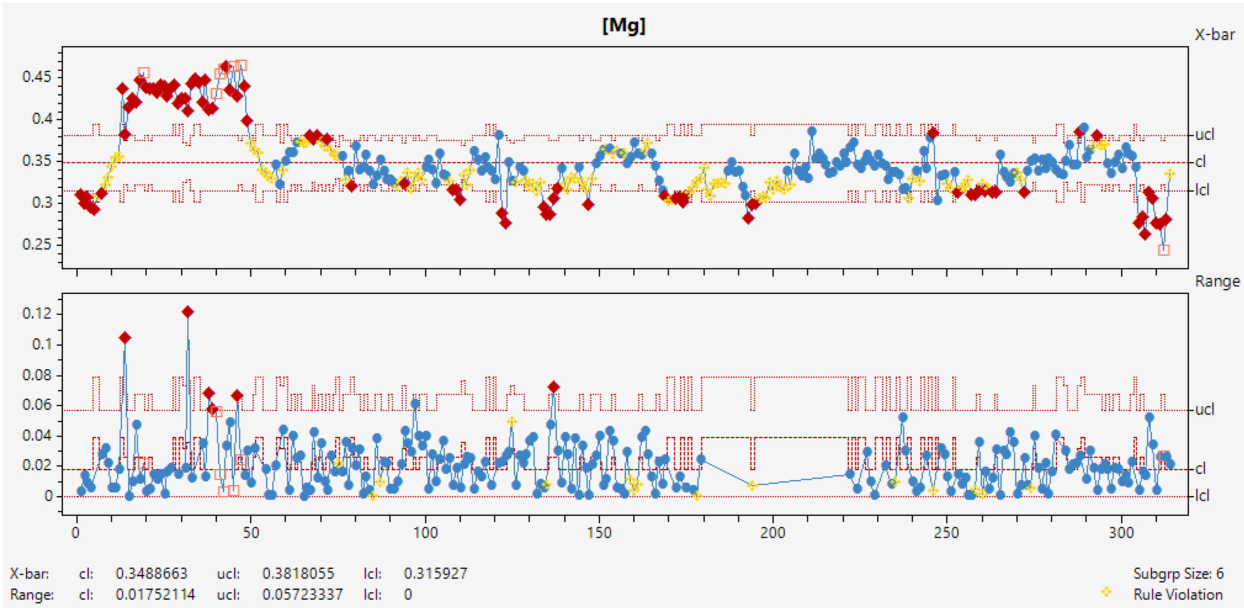
Rule Violation

Mg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0
ucl
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lcl
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100
150
200
250
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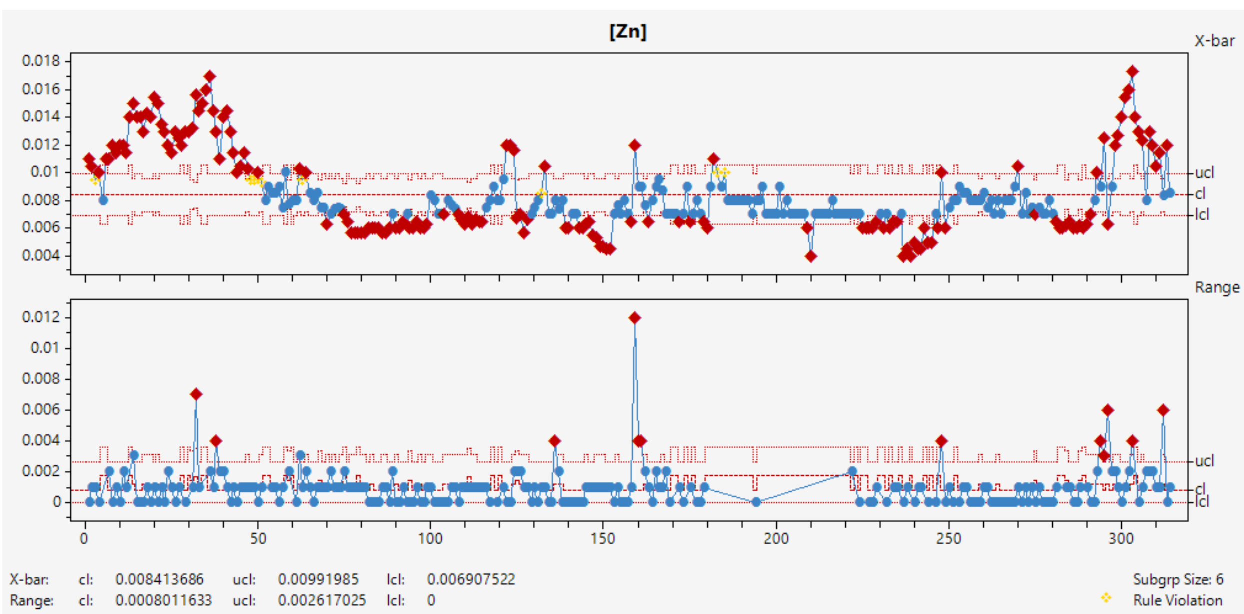
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ucl
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0
50
100
150
200
250
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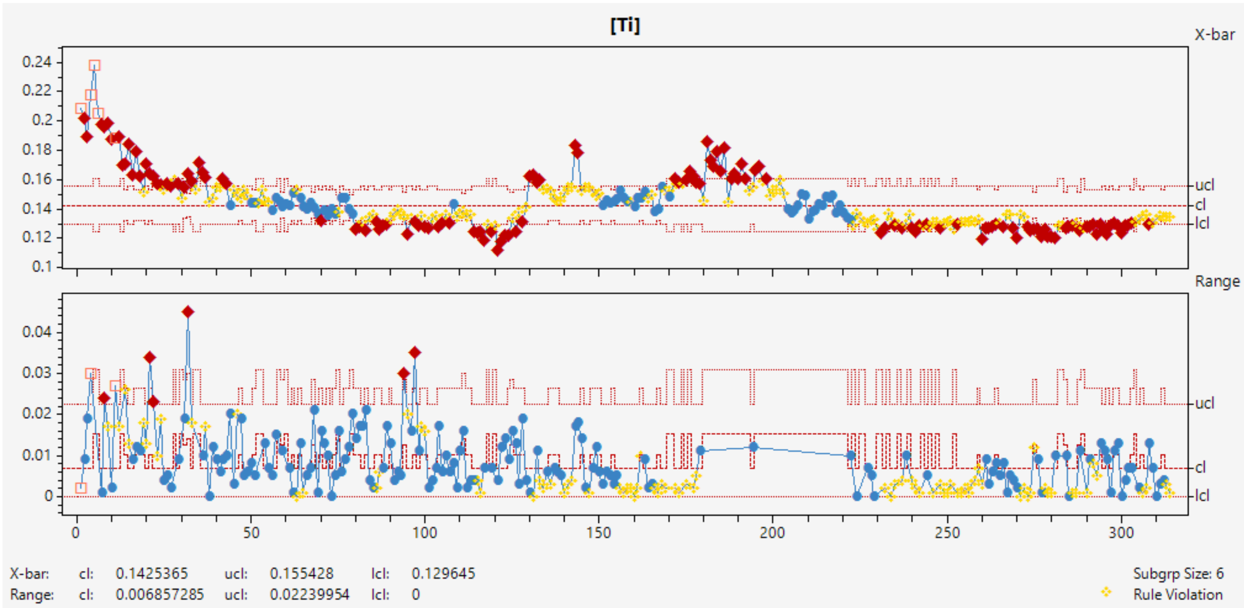
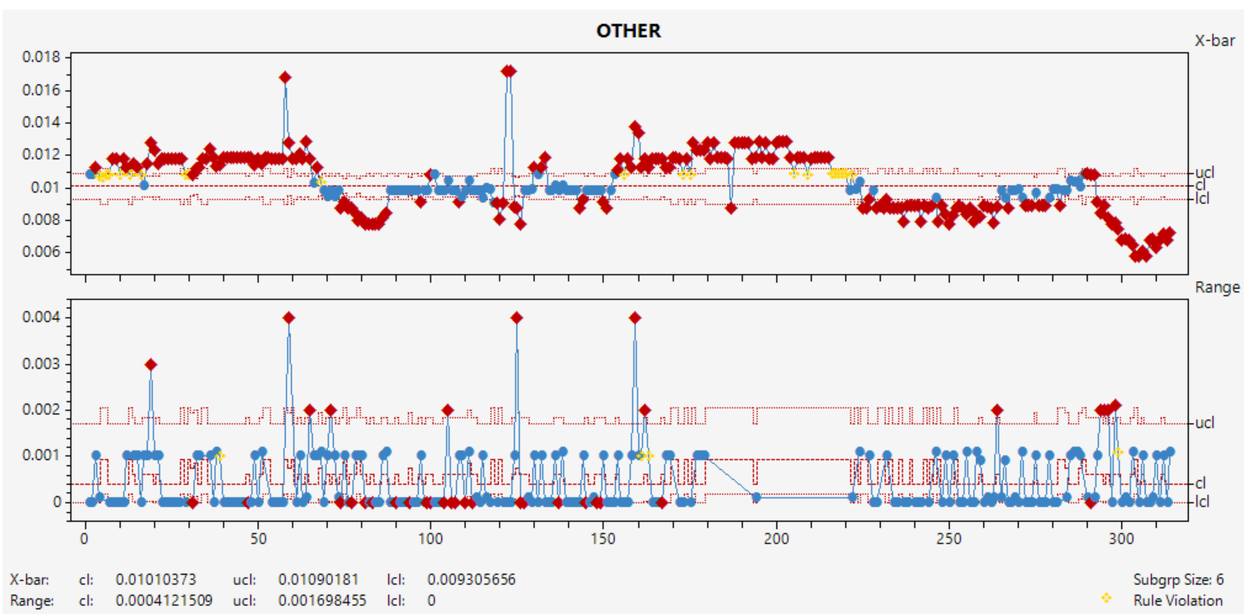
Rule Violation

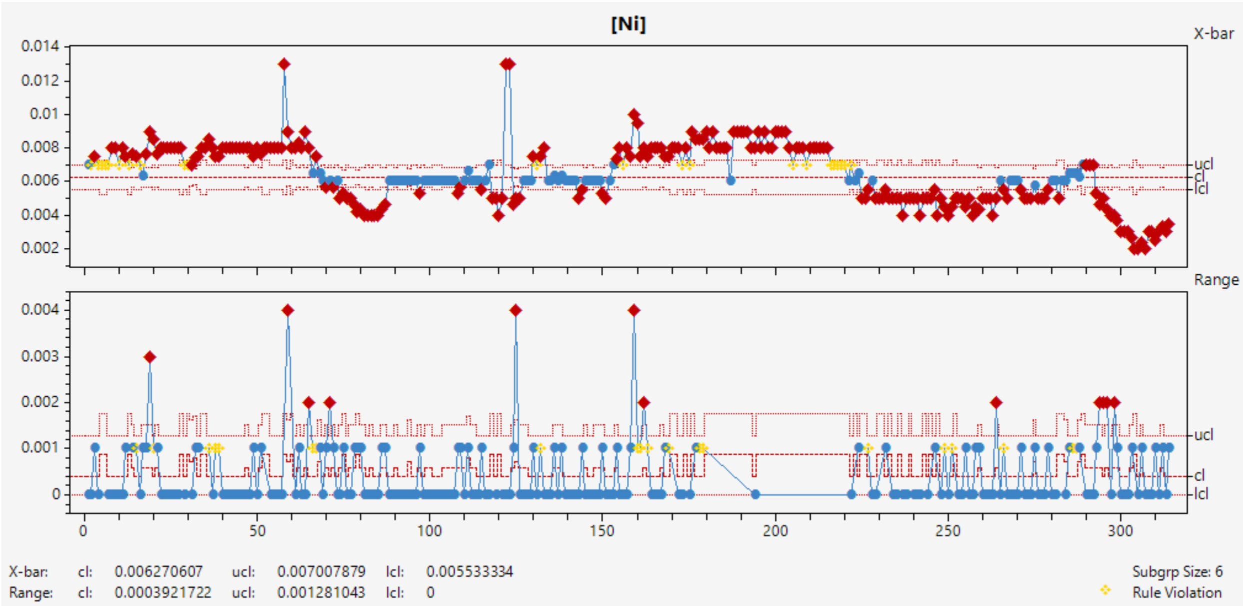
Ti



Other Combined (NI + PB + SN + CR + BE)



Ni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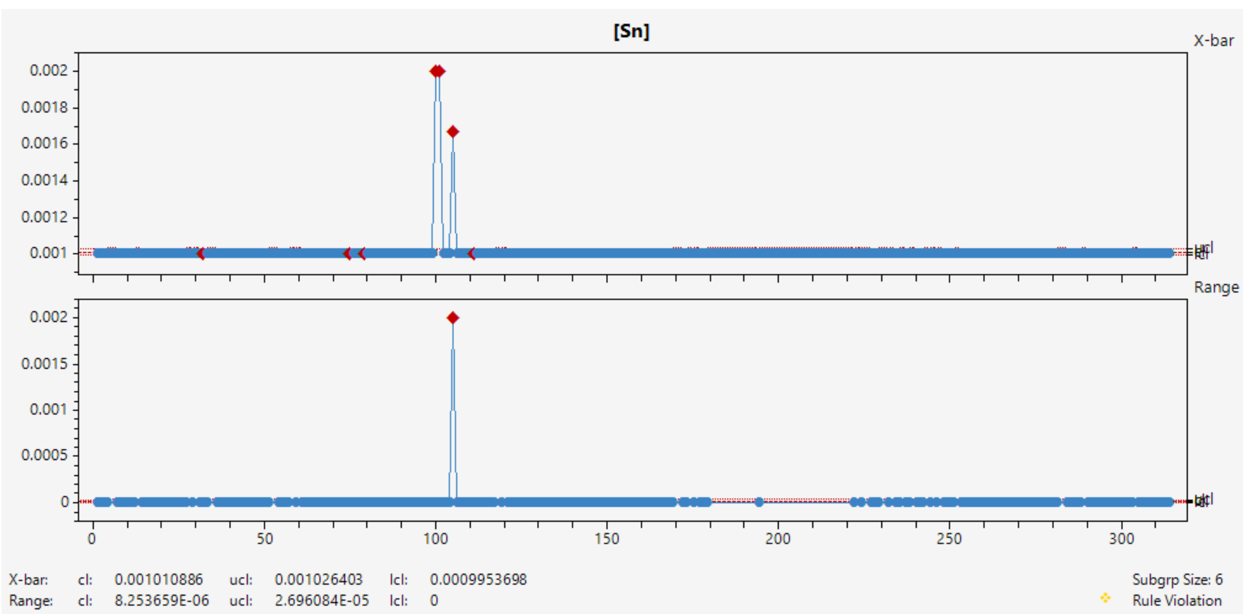
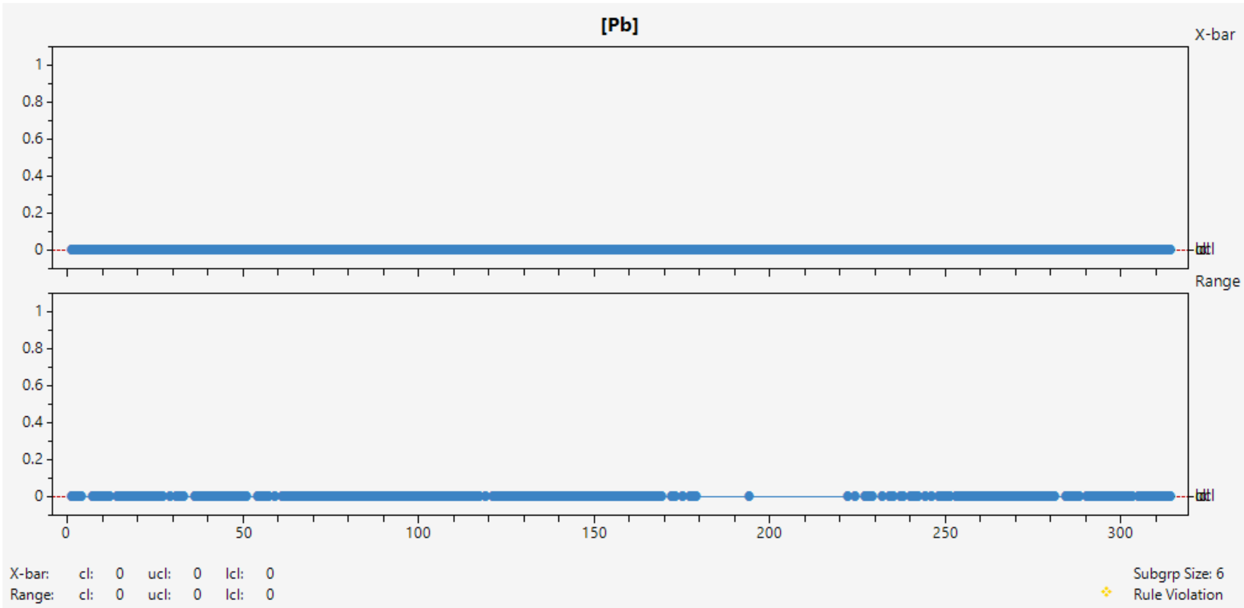
Rule Violation

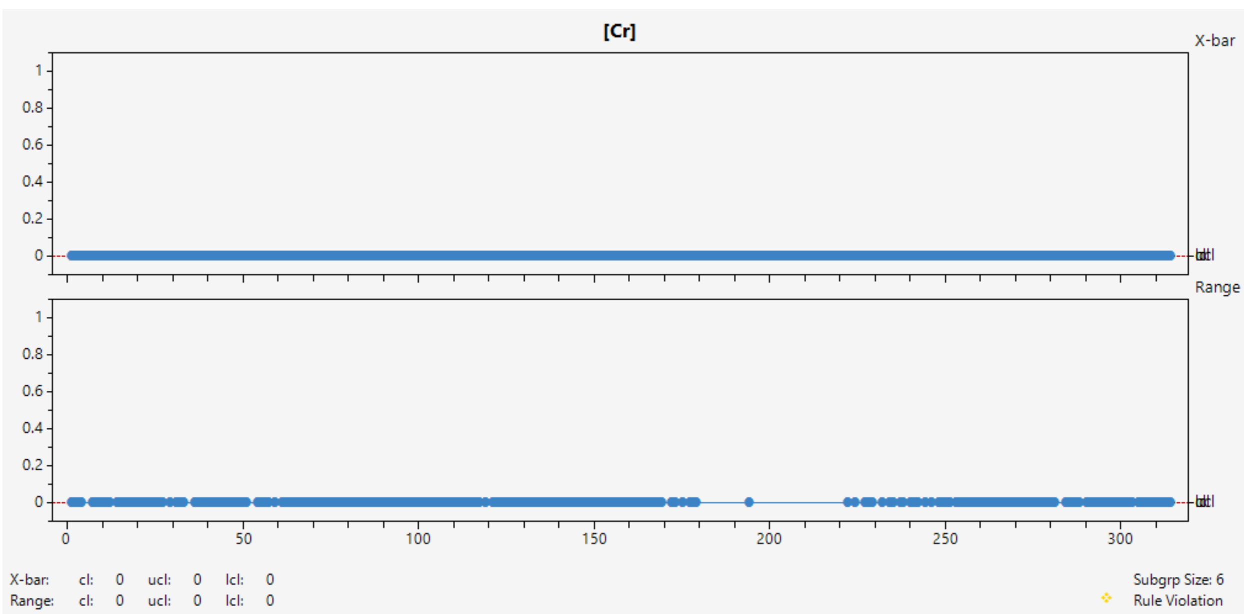
Sn


[Sn]
X-bar
Range
X-bar: cl: 0.001010886 ucl: 0.001026403 lcl: 0.0009953698
Range: cl: 8.253659E-06 ucl: 2.696084E-05 lcl: 0
Subgrp Size: 6
Rule Violation

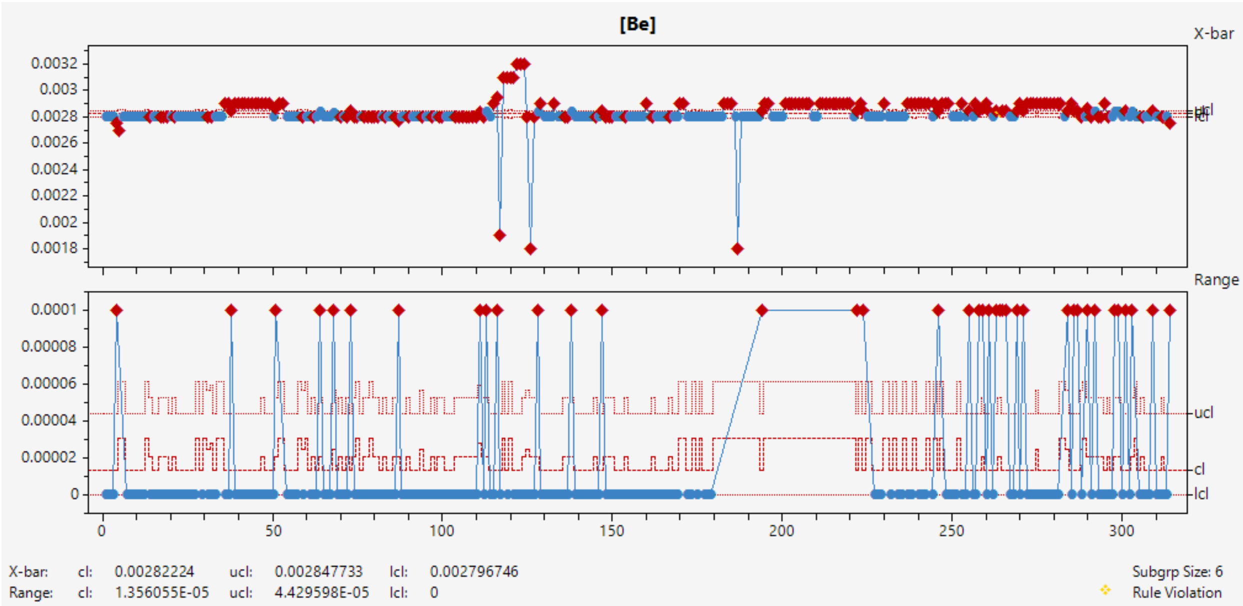
Pb


[Pb]
X-bar
1
0.8
0.6
0.4
0.2
0
Range
0
50
100
150
200
250
300
X-bar: cl: 0 ucl: 0 lcl: 0
Range: cl: 0 ucl: 0 lcl: 0
Subgrp Size: 6
Rule Violation

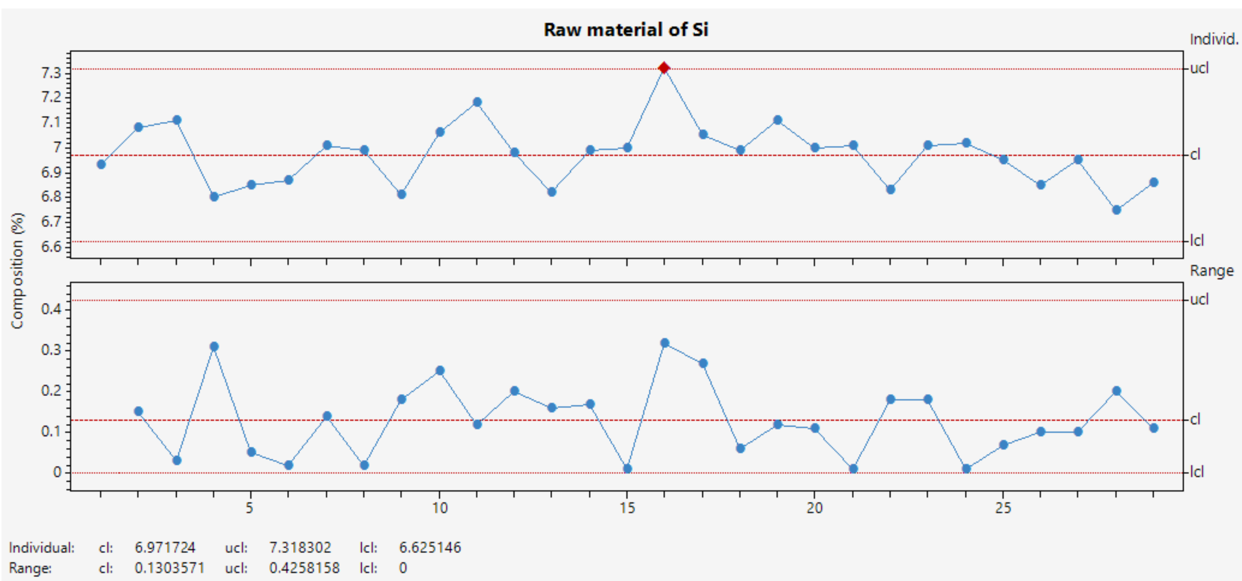
Cr

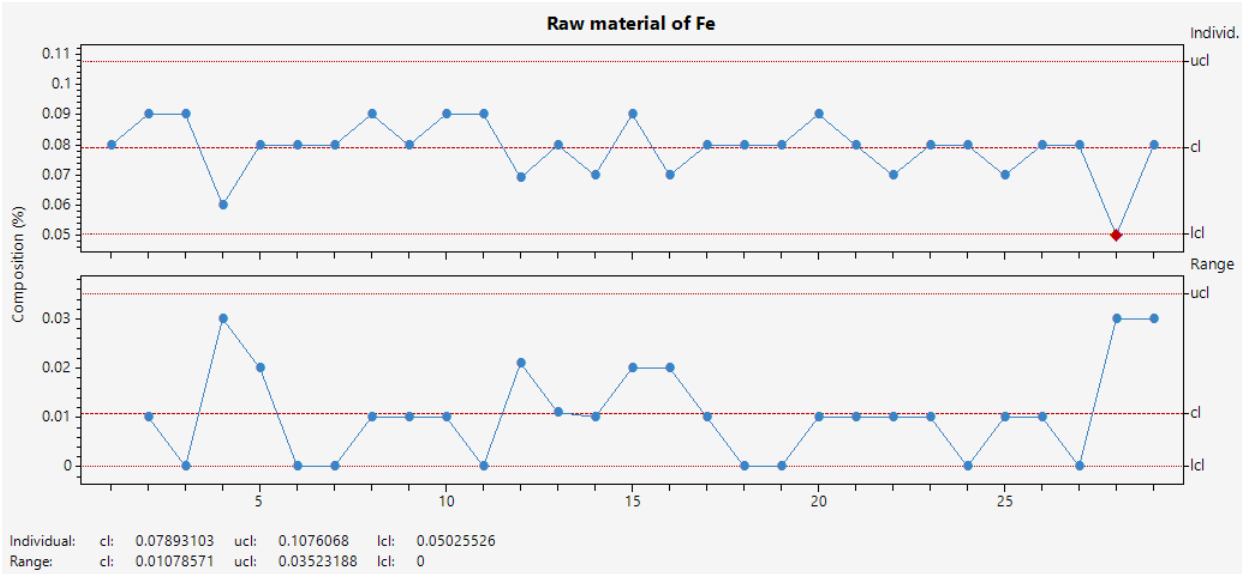

[Cr]
X-bar
1
0.8
0.6
0.4
0.2
0
Range
0
50
100
150
200
250
300
X-bar: cl: 0 ucl: 0 lcl: 0
Range: cl: 0 ucl: 0 lcl: 0
Subgrp Size: 6
Rule Violation

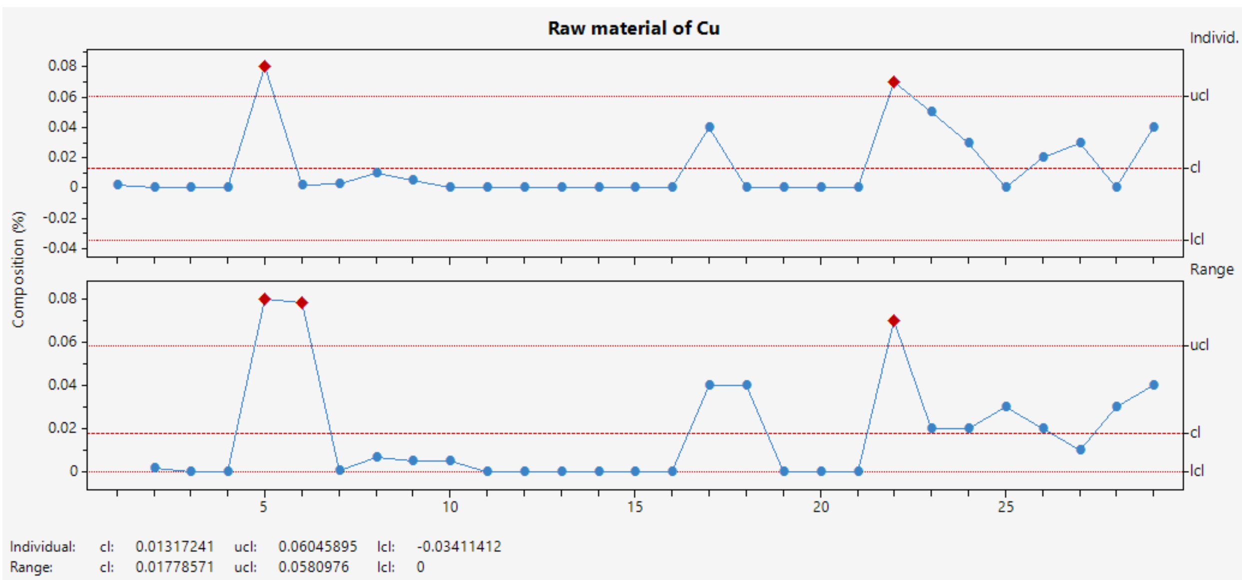
Be

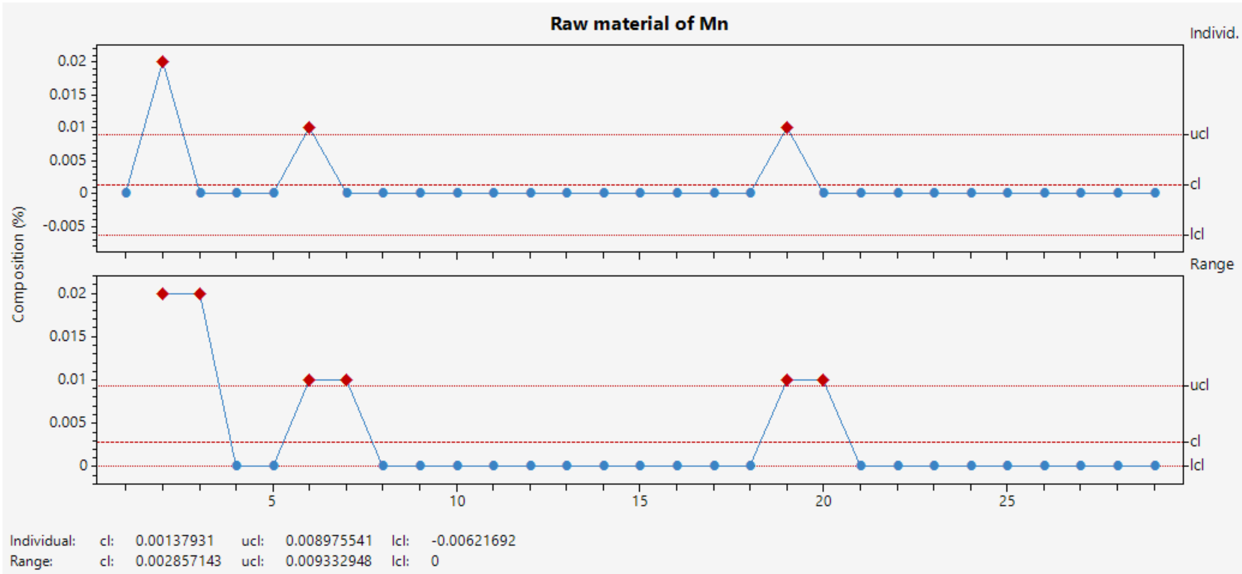


Appendix G: X-bar and MR chart for seven elements' raw material composition.

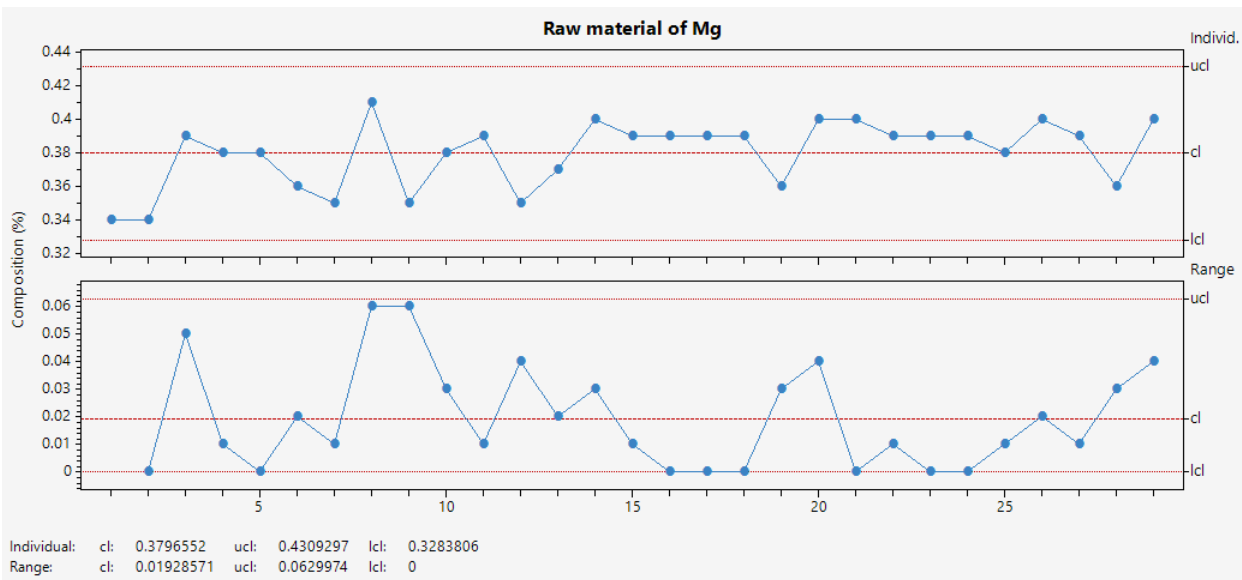



Raw material of Fe
Individ.
ucl
cl
lcl
Range
Composition (%)
Individual: cl: 0.07893103 ucl: 0.1076068 lcl: 0.05025526
Range: cl: 0.01078571 ucl: 0.03523188 lcl: 0

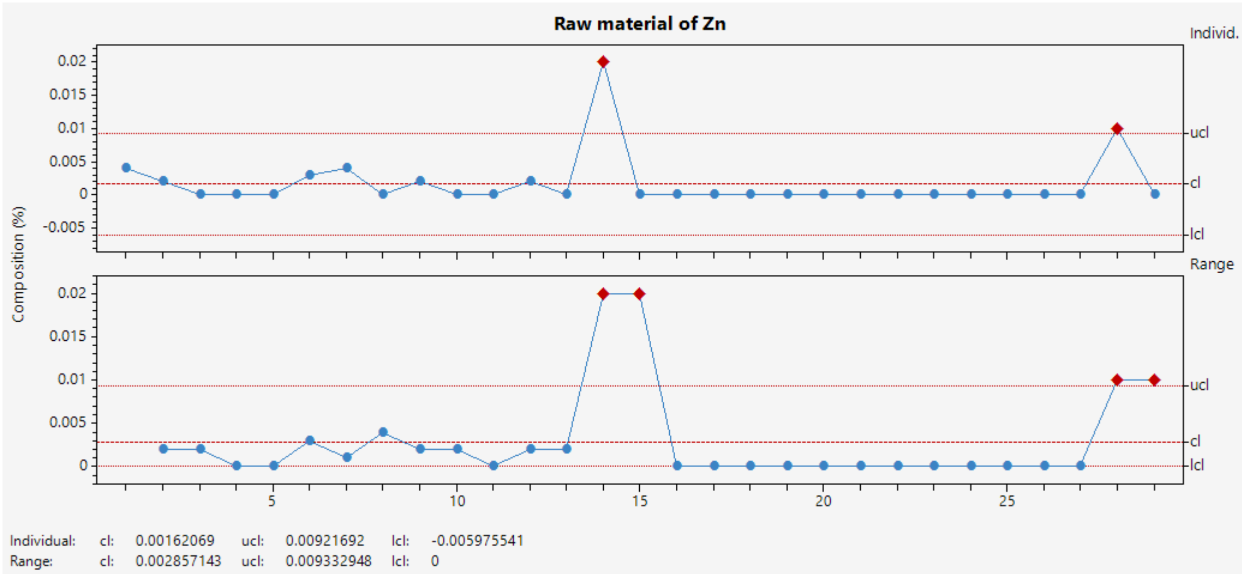

Raw material of Cu
Individ.
ucl
cl
lcl
Range
Composition (%)
Individual: cl: 0.01317241 ucl: 0.06045895 lcl: -0.03411412
Range: cl: 0.01778571 ucl: 0.0580976 lcl: 0



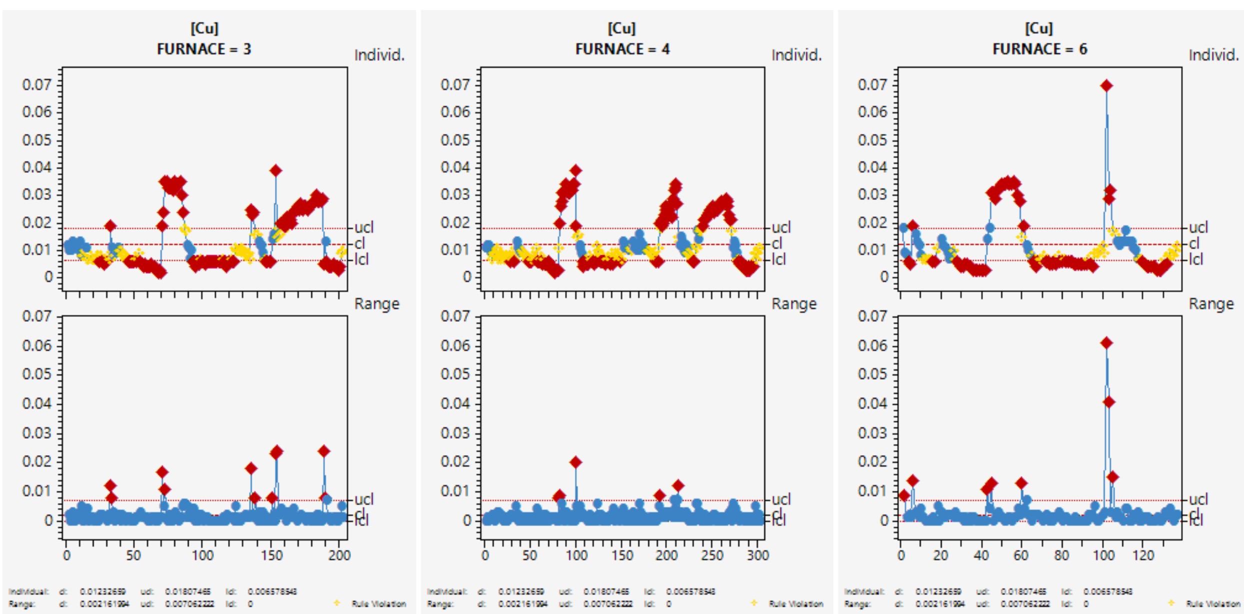
Raw material of Mn
Individ.
Range
ucl
cl
lcl
Composition (%)
Individual: cl: 0.00137931 ucl: 0.008975541 lcl: -0.00621692
Range: cl: 0.002857143 ucl: 0.009332948 lcl: 0

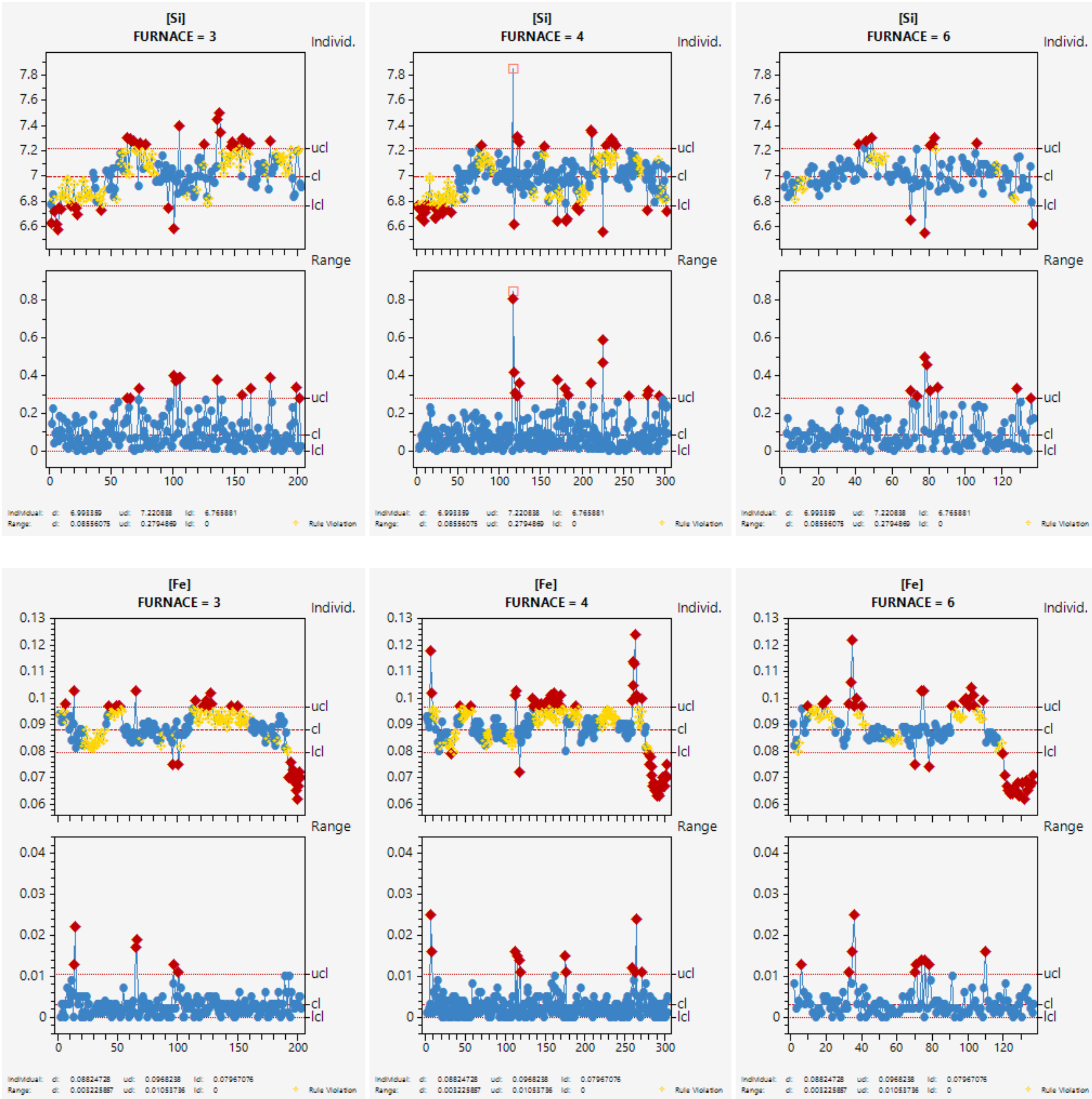


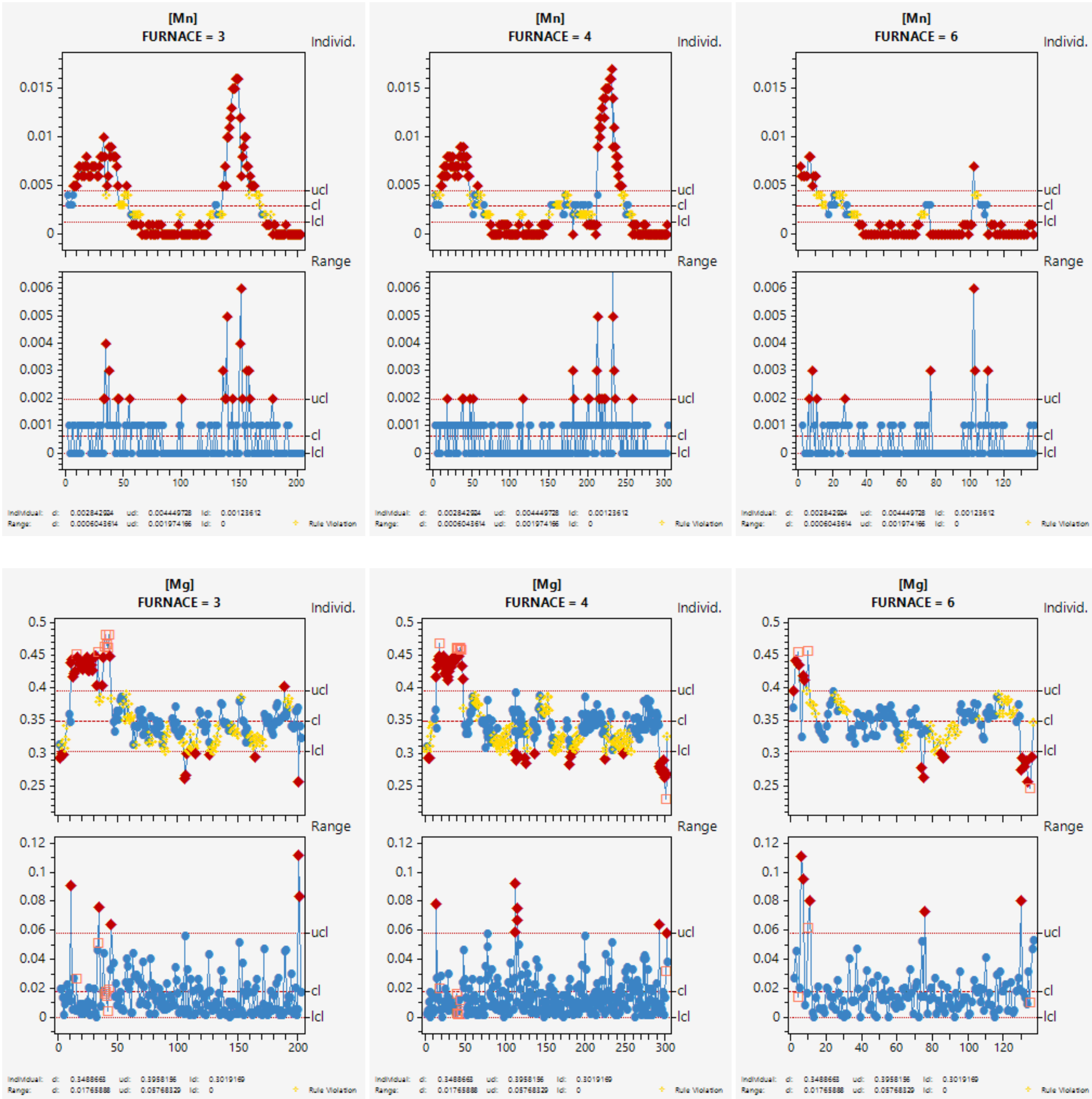
Raw material of Mg
Individ.
Range
ucl
cl
lcl
Composition (%)
Individual: cl: 0.3796552 ucl: 0.4309297 lcl: 0.3283806
Range: cl: 0.01928571 ucl: 0.0629974 lcl: 0

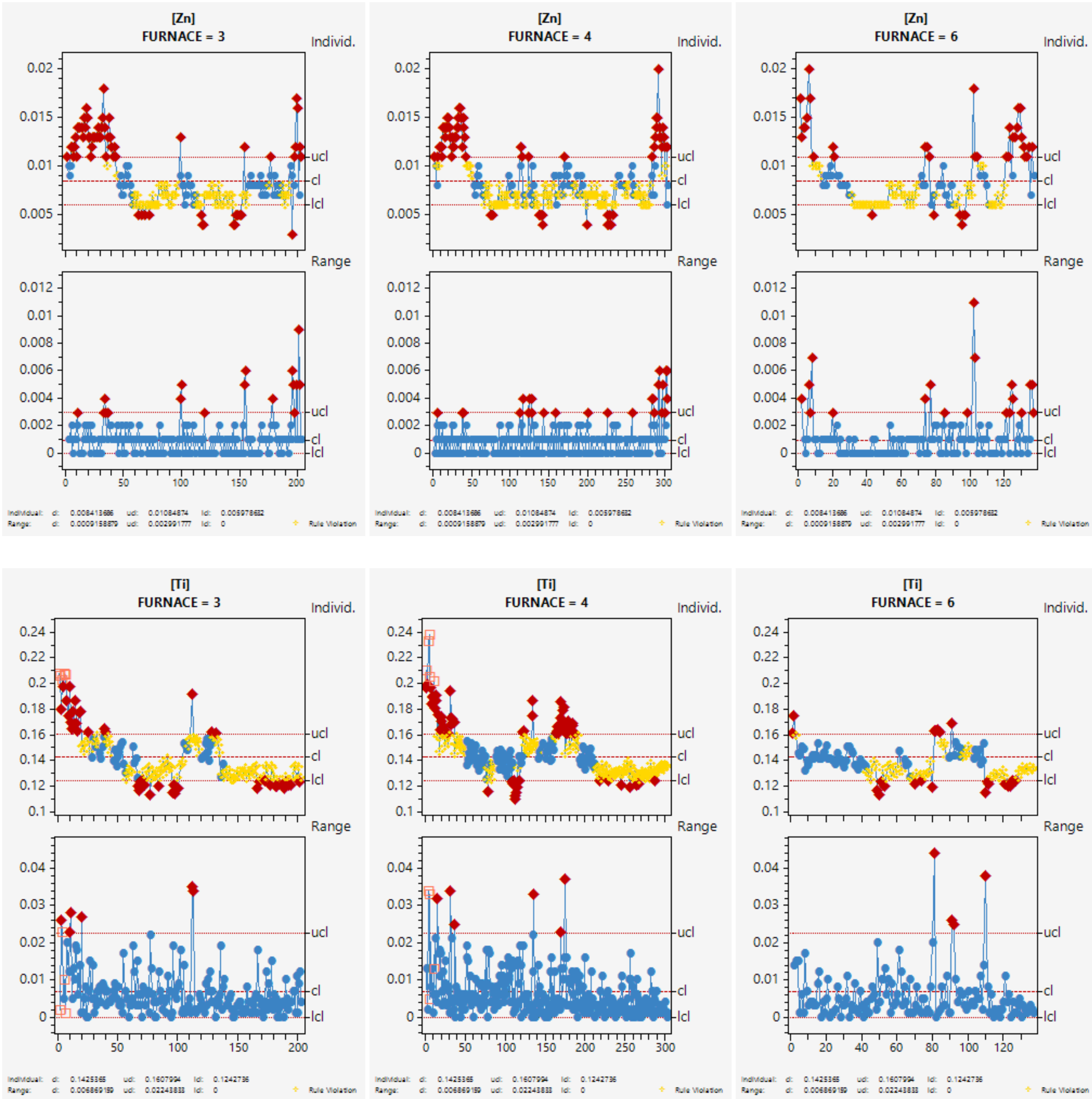


Appendix H: X-bar and MR chart for element Si, Mg and TI's furnace of the melt composition.

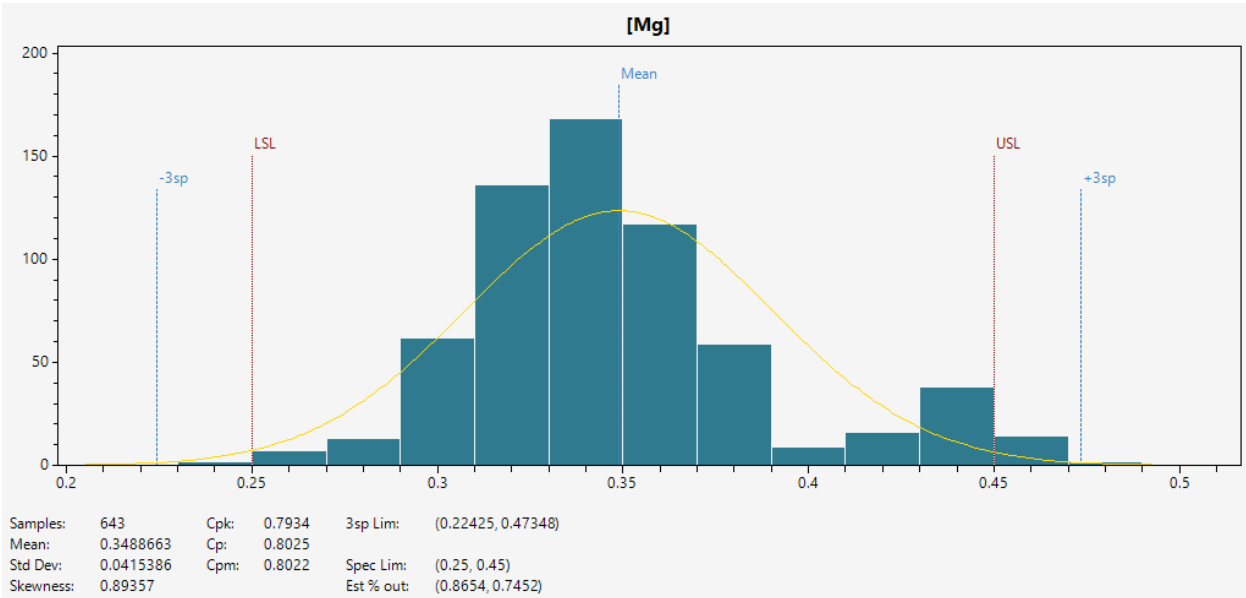



[Si]
FURNACE = 3
[Si]
FURNACE = 4
[Si]
FURNACE = 6
Individ.
Range
ucl
cl
lcl
Rule Violation
[Fe]
FURNACE = 3
[Fe]
FURNACE = 4
[Fe]
FURNACE = 6


[Mn]
FURNACE = 3
[Mn]
FURNACE = 4
[Mn]
FURNACE = 6
[Mg]
FURNACE = 3
[Mg]
FURNACE = 4
[Mg]
FURNACE = 6
Individ.
Range
ucl
cl
lcl
Rule Violation


[Zn]
FURNACE = 3
[Zn]
FURNACE = 4
[Zn]
FURNACE = 6
Individ.
Range
ucl
cl
lcl
Individual: cl: 0.008413686 ucl: 0.01084874 lcl: 0.005978652
Range: cl: 0.0009158879 ucl: 0.002991777 lcl: 0
Rule Violation
[Ti]
FURNACE = 3
[Ti]
FURNACE = 4
[Ti]
FURNACE = 6
Individual: cl: 0.1425365 ucl: 0.1607994 lcl: 0.1242736
Range: cl: 0.006869159 ucl: 0.02243833 lcl: 0
Rule Violation

Appendix I: Histogram of Process Capability

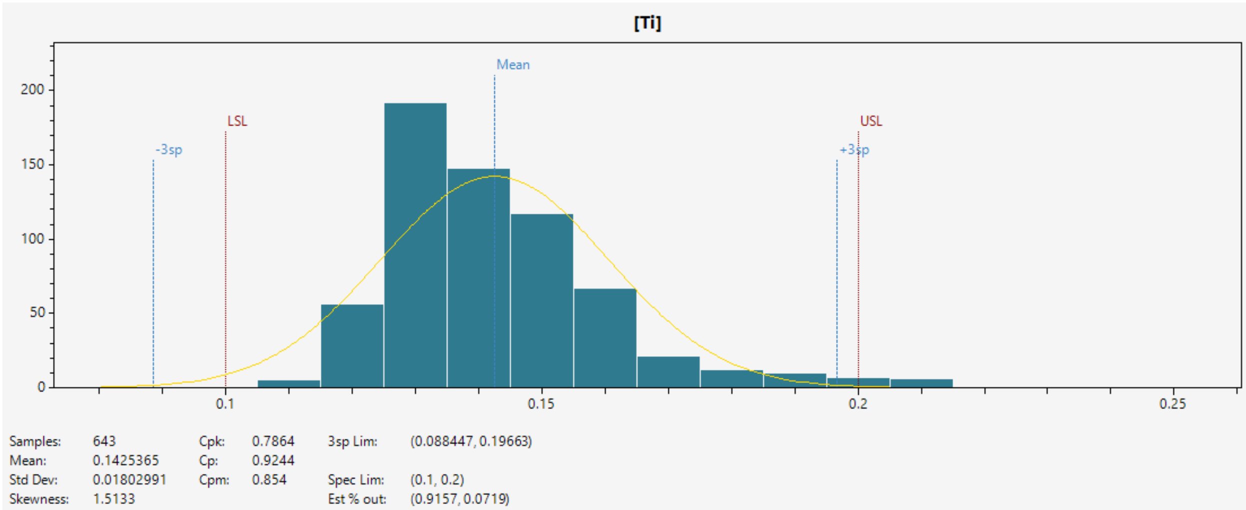


Histogram of Sampled Magnesium Composition

Capability Report

Variable	Lower Specification Limit	Upper Specification Limit	Cp	Estimated % Outside Specification
CU	0	0.18	3.3018	8.7447
SI	6.5	7.5	1.0914	0.1071
FE	0	0.15	3.0049	0.0000
MN	0	0.1	4.6843	21.2136
MG	0.25	0.45	0.8025	1.6106
ZN	0	0.1	5.8551	0.1560
NI	0	0.05	4.8403	0.0135
PB	0	0.05	Cannot calculate	Cannot calculate
SN	0	0.05	70.6824	0.0000
TI	0.1	0.2	0.9244	0.9875
CR	0	0.05	Cannot calculate	Cannot calculate
BE	0	0.05	71.9507	0.0000
OTHER	0	0.15	14.3830	0.0000

Capability report of all materials composition



Process Capability Histogram of Titanium Composition

Appendix J: Equation

$$C_p = \frac{USL - LSL}{6 * \sigma}$$

Formula of the capability index

Parameters:

USL=Upper specification limit.

LSL=Lower specification limit.

σ=Standard deviation.

Appendix K: Group contract

Team's goals for the collaboration.

Our team's goal is to complete the case study to the very best of our combined ability and use the skills that we have learned over the course of the semester and complete the project on time.

Responsible and roles.

Our team believes in a more collaborative approach rather than individual task delegation. We hope to maintain thorough communication and work closely together on the report and presentation. Responsibilities and tasks will be assigned equally as we progress through the timeline we have set for ourselves.

Timetable for activities.

Week of 06/23:

Read Case Study

Make an individual initial analysis

Week of 06/30:

Begin and finish the executive summary by the end of the week

Week of 07/07:

Begin working on the report

Make sure to answer all analysis questions

Include any detailed analyses, charts or graphs

Finalize recommendations

Week of 07/14:

Wrap up report writing

Delegate presentation work

Begin presentation recordings

July 15th/16th/17th: Final editing and submission

Team's expectations regarding meeting attendance.

Given the time zone differences, we want to maximize the things we need to do during meeting times (eg. in person discussions and final checks on reports) while minimizing how often and how long each meeting takes. We want to emphasized communicating via messages, emails and through comments on reports.

The expectations are:

+ Leave detailed comments and do brief write up updating on current progress
+ Contribute to the team through helping and recommending changes via comments or minor edits

+ Participate in discussions during the meetings
+ Doing assigned work

An acceptable excuse for missing a meeting or a deadline and types of excuses will not be considered acceptable.

Acceptable excuses are one-time circumstantial problems that are informed beforehand at the beginning of the week. We would want to be clear and upfront how much work we can get done at the beginning of the week so we can plan and delegate appropriately.
In case of emergency it'd would be best if we can be informed at least a day before, excuses made less than a day before expected completion or update on work won't be accepted. Our reasoning is that it provides the team with less than ideal time to replan the workload, jeopardizing our progress.

Team members follow if they have an emergency and cannot attend a team meeting or complete their individual work promised to the team.

If a team member experiences an emergency that prevents them from completing their assigned work, the team member should inform the group as soon as possible before the deadline. We understand emergencies happen so the team will respond with understanding and flexibility while still maintaining the process to finish the case study.

Team's expectations regarding the quality of team members' preparation for team meetings and the quality of the deliverables that members bring to the team.

We believe that each team member should keep the timeline in mind and be prepared at the beginning of each week to take on the tasks assigned to them.

Team's expectations regarding team members' ideas, interactions with the team, cooperation, attitudes, and anything else regarding team-member contributions

We want to be open to discussion with all ideas, workshopping them if we feel like there's potential developments. As such we want team members to be open and engage actively with each other's suggestions. When disagreements arise, we want to either work on the compromises or let it be decided through majority vote.

Methods will be used to keep the team on track.

As mentioned earlier, everything comes down to how well we are communicating with each other. Hence, it will be important for each team member to regularly check the group chat and respond whenever they are addressed. We'll consider additional tools like Gaant chart if further coordination is needed.