Assignment #2: Mineral process -1

Objective: To understand the relationship between the process variables and the output variables of the Rougher/Scavenger sub system and look for trends, and abnormal process points. The data set Rosc.xls has **13** process variables measured on the cleaner system, and **10** output variables (total 23 variables). These measurements were taken hourly over a period of 350 hours.

A description of the variables

Process variables (x variables) first 13 variables in the data file	Output variables (y variables)
1. fresh ore feedrate	14. Rs tail flowrate
2. slurry percentage of solids in the GC product or the FC feed	15. Rs tail Pb content
3. % of particle finer than 37um in the GC product	16. Rs tail Pb flowrate
4. Pb content in FC feed	17. rougher concentrate Pb content
5. Cu content in Fc feed	18. rougher concentrate Cu content
6. Pb flowrate in FC feed	19. Rs concentrate flowrate
7. Cu flowrate in Fc feed	20. Rs concentrate Pb content
8. soda ash flowrate to GC	21. Rs concentrate Pb flowrate
9. pH in FC feed	22. Rs Pb recovery
10. air flowrate to aerator	23. Rs Pb floatability
11. xanthate flowrate to RS	
12. xanthate per ton of Pb and Cu to FC	
13. promoter flowrate / xanthate flowrate	

You shall do the following: Make a PLS of the process(X) and output(Y) to find out

- **a.** What is the underlying dimensionality and can the PLS model be interpreted?
- **b.** Which are the important X variables, and which Y's are well explained?
- **c.** Can you interpret the correlation structure?
- **d.** Do you see any trend and can you interpret it?
- **e.** Can one find and interpret outliers in the DModX or DModY plot?

Hints

1. Preliminary analysis

In PLS modeling,

Select the first 13 variables as X's and the last 10 as Y's

Which Y's are well explained and which Y's are poorly explained?

Scores: **Plot** t1 vs u1, and t1 vs t2 ?

Do you see any outliers? are they severe?

2. Second round

In order to focus on the well explained Y's, fit a PLS model excluding the poorly explained Y's.

Which Y's are very well explained

Scores: Plot t1 vs u1, and t1 vs t2

Do you still see the same outliers?

Trends:

Scores: Plot Num(running index) vs u1 and then Num vs u2

Do you see any trend?

Plot Num vs t1 and t2

Do you see the same trends?

Loadings : To interpret the trends, Plot wc1 vs wc2 and interpret the correlation structure.

3. To look for moderate outliers, or anomalies in the objects (process points),

plot DModX and DModY (distance to model) vs object number.

Do you see moderate outliers?

4. "**Contribution: DModY**" to understand why an observation is an outlier in DMoDY.

Click on Contribution, DModY, mark the observation number, dimension(4), weight (RX) and click on OK.