

Supplementary material

Supplementary Table 1 - Pearson correlation coefficients of all variables.

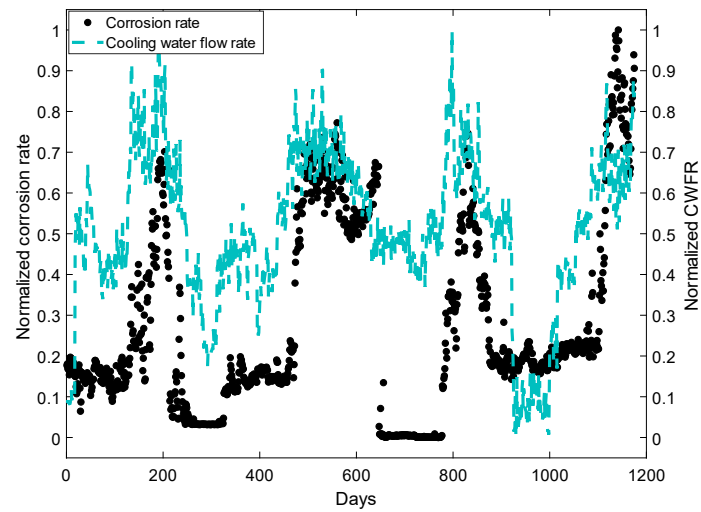
Variables	CC	Variables	CC	Variables	CC	Variables	CC
CWFR	0.57	Benzotriazole (t-1)	0.23	Inhibitor A (t-1)	0.16	TIC	0.10
CWFR (t-1)	0.56	Benzotriazole (t-2)	0.22	HCO ₃ ⁻	0.15	Orthophosphate (t-1)	0.10
CWFR (t-2)	0.56	Ca ²⁺ /Mg ²⁺	0.22	Inhibitor A (t-2)	0.15	Orthophosphate (t-2)	0.08
CWFR (t-3)	0.56	Benzotriazole (t-3)	0.22	Conductivity	0.14	Orthophosphate (t-3)	0.08
CWFR (t-4)	0.56	Turbidity	0.21	Zinc (t-3)	0.14	COD	0.08
Benzotriazole	0.35	Silicates	0.20	Zinc (t-2)	0.14	AOX	0.07
Ca ²⁺	0.32	Zinc	0.19	TOC	0.14	Organic phosphorous	0.04
Manganese	0.32	Thickening agent	0.18	Inhibitor A (t-3)	0.14	TIN	0.03
pH	0.32	Temperature	0.17	Zinc (t-1)	0.14	Sodium	0.03
Bacterial count	0.26	Inhibitor A	0.17	Orthophosphate	0.12	Nitrate	0.02
Dissolved zinc	0.25	TC	0.16	Sulfate	0.12		
Chloride	0.24	KS4.3	0.16	Total phosphorous	0.11		

Supplementary Table 2 - PLS coefficients.

	Division 1	Division 2	Division 3	Division 4	Without Benzotriazole
Benzotriazole	-1.30	-3.28	-0.70	-1.79	-
Inhibitor A	3.15	2.43	4.19	3.43	4.20
Orthophosphate	2.56	1.01	2.45	1.54	2.49
Zinc	-2.25	0.08	-2.51	-1.31	-2.29
COD	-0.39	-1.004	-1.41	-0.59	-1.23
AOX	0.05	-0.93	-0.46	-0.23	-0.63
Zinc (t-1)	-1.38	0.14	-1.49	-0.86	-1.36
Total phosphates	0.71	0.86	0.88	1.04	1.10
Zinc (t-3)	-1.57	0.21	-1.72	-0.94	-1.54
Zinc (t-2)	-1.62	0.18	-1.76	-1.00	-1.59
Ca ²⁺ /Mg ²⁺	1.06	2.70	0.73	2.59	1.83
Organic phosphate	-0.23	1.05	0.82	1.13	0.80
TIC	1.36	-0.40	1.55	1.87	1.90
Inhibitor A (t-3)	1.20	1.25	1.51	1.55	1.73
Inhibitor A (t-2)	1.17	1.27	1.51	1.54	1.75
Sulfate	1.33	3.68	1.41	3.28	2.95

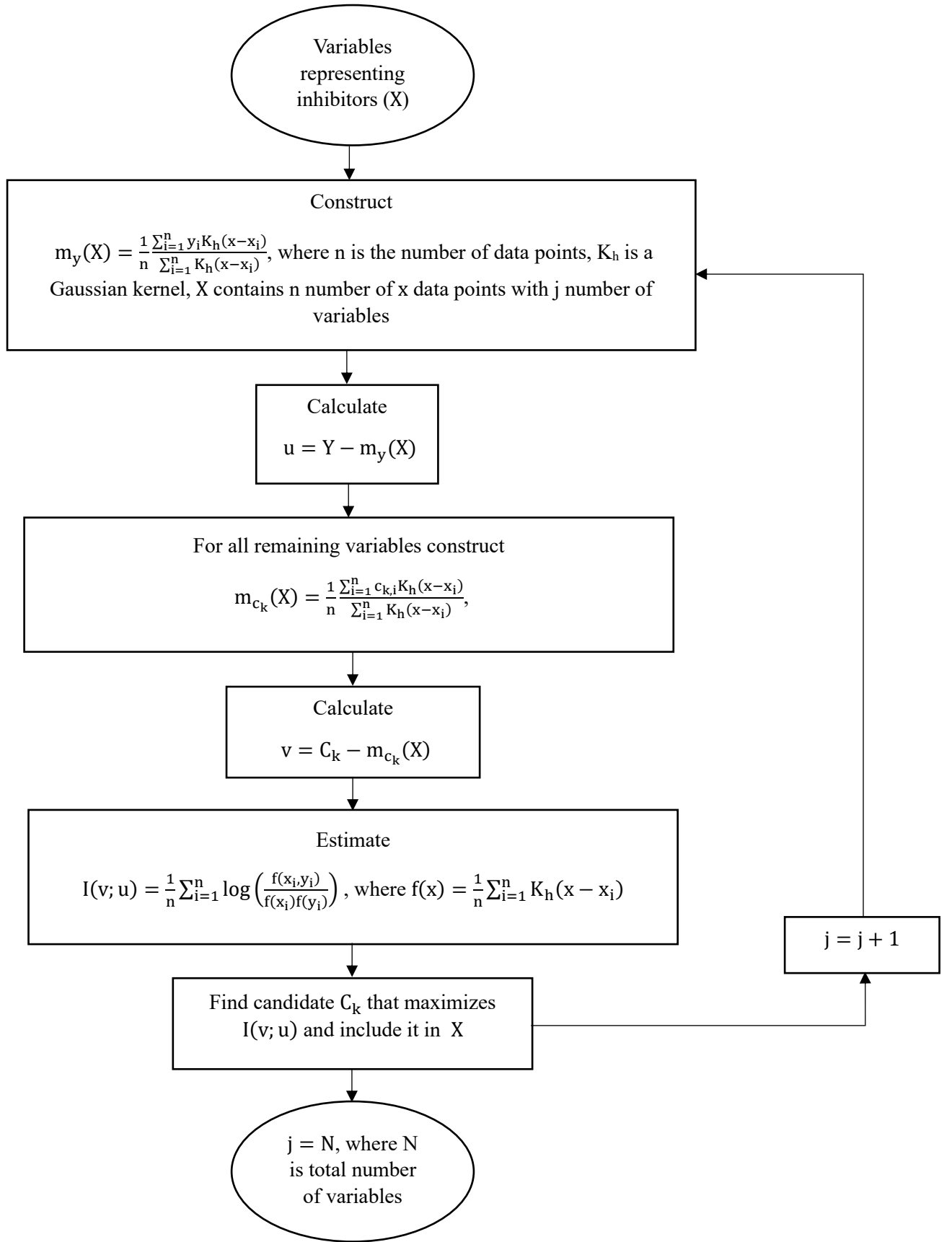
Supplementary Table 3 - Statistical properties of the total and reduced data sets

Mean			
Data set	C _{bc}	I _{corr}	T
Total data set	0.48	0.0051	293.55
Reduced data set	0.47	0.0050	293.52
Minimum			
Data set	C _{bc}	I _{corr}	T
Total data set	0.0002	0.0020	288.80
Reduced data set	0.0041	0.0020	288.80
Maximum			
Data set	C _{bc}	I _{corr}	T
Total data set	1.00	0.0112	297.70
Reduced data set	1.00	0.0108	296.80

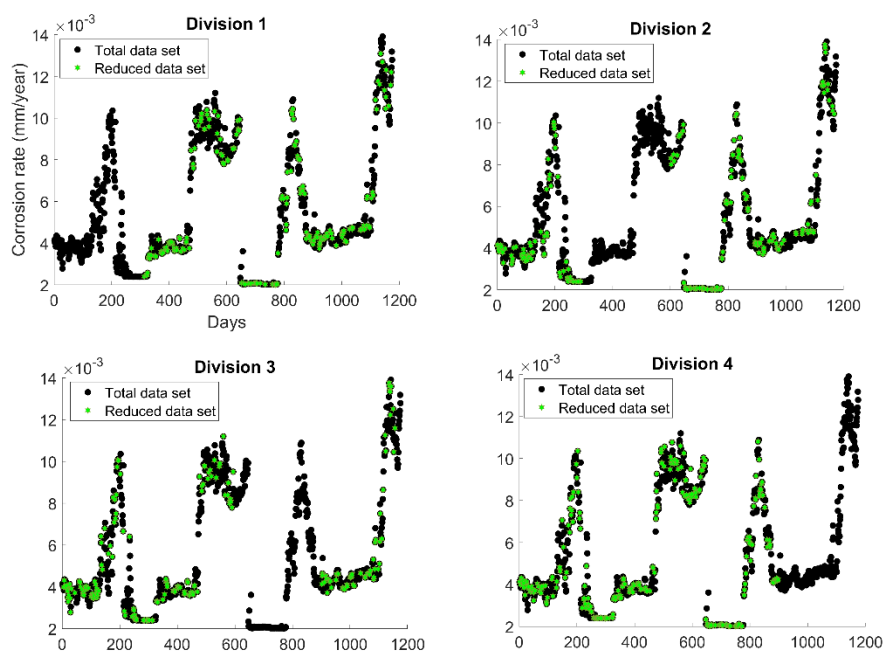


Supplementary Figure 1 – Correlation between the cooling water flow rate and corrosion rate

The corrosion rate appears to increase with CWFR. It is likely that CWFR shears the protective layer on the metal surface when it is periodically increased.



Supplementary Figure 2 – Algorithm for implementing magnitude-based partial mutual information



Supplementary Figure 3 - Data points selected for model development

The luminescent green stars represent data points included in the training data set for model development. Filled black circles represent the all the data points available from the time duration.

Supplementary Table 4 - Input variables selected by Pearson correlation coefficient for data driven model development for the direct prediction of the corrosion rate.

Division 1	Division 2	Division 3	Division 4
CWFR	Manganese	CWFR(t-3)	CWFR(t-3)
CWFR(t-1)	CWFR	CWFR(t-2)	CWFR(t-2)
CWFR(t-2)	CWFR(t-2)	CWFR(t-4)	CWFR(t-1)
CWFR(t-3)	CWFR(t-1)	CWFR(t-1)	CWFR(t-4)
CWFR(t-4)	CWFR(t-4)	CWFR	CWFR
pH	CWFR(t-3)	Benzotriazole(t-1)	pH
Benzotriazole	Benzotriazole	Benzotriazole(t-2)	Turbidity
Manganese	Ca ²⁺	Bacterial count	Ca ²⁺
Chloride	Silicates	Benzotriazole	TC