

Supplementary material file SA: Process performance modeling

Solar drying of sludge from a steel wire drawing industry

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Table S1 shows the results of the Doehlert model of the at least two duplicate runs. The set of experimental design explain the effect of temperature and air velocity on solid yield. To study the reproducibility of the design points, the center point in the model has been repeated 5 times.

Table S1. Experimental design Doehlert

Run	Factors		Response	
	Variable X ₁ (T [°C])	Variable X ₂ (Velocity [mp/s])	Y (MY [%])	Ŷ (MY [%])
1	1 (66)	0 (1.1)	58.4	60.9
2	0.5 (58.5)	0.866 (1.2)	61.5	59.0
3	-1 (36)	0 (1.1)	76.7	74.2
4	-0.5 (43.5)	-0.866 (1)	46.4	48.9
5	0.5 (58.5)	-0.866 (1)	61.5	59.0
6	-0.5 (43.5)	0.866 (1.2)	80.0	82.5
7	0 (51)	0 (1.1)	66.3	68.2
8	0 (51)	0 (1.1)	65.0	68.2
9	0 (51)	0 (1.1)	71.2	68.2

10	0 (51)	0 (1.1)	70.0	68.2
11	0 (51)	0 (1.1)	68.4	68.2

Figure S1 Depicts the corresponding response of the Doehlert model applied to the drying system.

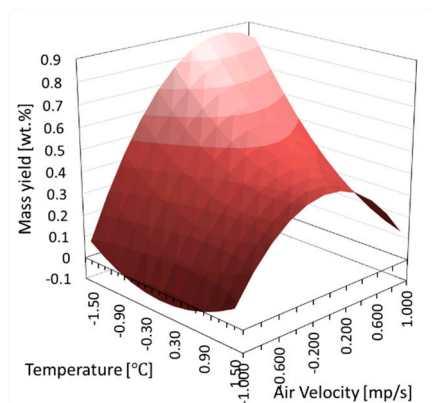


Figure S1. surface plot for the drying system based on a model with temperature and air velocity as input factor for drying yield as response.

Figure S2 displayed the residual and the normal probability plots.

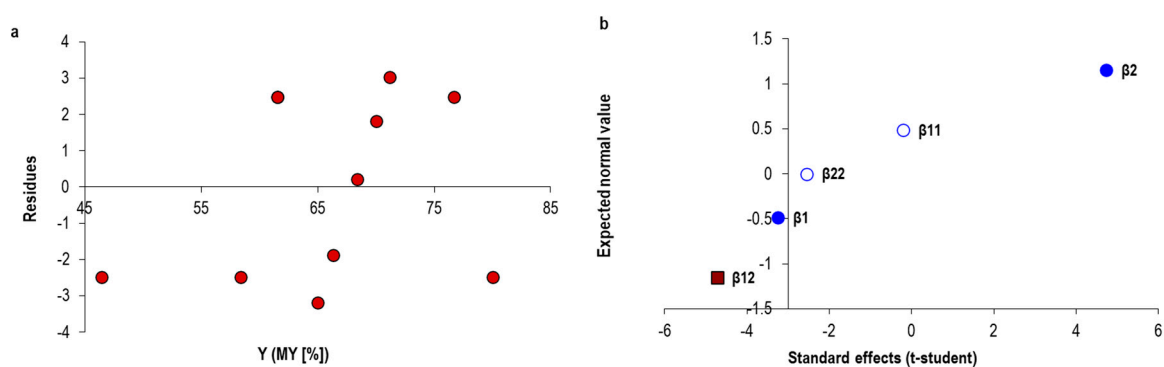


Figure S2. (a) residues plot and (b) normal probability plots of drying model.

Table S2 and S3 summarizes the respective terms and regression coefficients on solid yield based on analysis of variance (ANOVA) at $\alpha=0.05$ and Table S3 shows the ANOVA

Table S2. Regression coefficient of the significant terms with respective p-value for the solid yield response.

	Coefficient			error	t(5)	p-value
SG	b₀	68.18	±	1.5890836	42.9052	1E-07
SG	b₁	-6.667	±	2.0514981	3.24966	0.0227
SG	b₂	9.7	±	2.0515583	4.728	0.0052
	b₁₁	-0.63	±	2.9729032	0.21191	0.8405
	b₂₂	-7.564	±	2.9730776	2.54409	0.0516
SG	b₁₂	-19.4	±	4.1031166	4.728	0.0052

Table S3. ANOVA – quadratic model for temperature and air velocity as representatives values of $p=0.05$

	Sum of Squares	DF	Mean Square	F-Value		P-Value
Regression	779.64	5	155.93	12.35	SG	0.008
Residuals	63.13	5	12.626			
F. Adjustment	37.002	1	37.002	5.6647		0.076
Error	26.128	4	6.532			
Total	842.77	10				
% variation explained				92.51		
% max. variation explained				96.90		