

Appendix A The input variables for modeling

Table S1. DCS tag number selected for modeling

#	DCS tag number	Location/remark
1	TI3106B	Top of quench nozzle
2	TI3106A	Bottom of quench nozzle
3	TI3111	Part of 'Y' form
4	FIC3105	Atomizing steam flow rate of return refining slurry
5	FIC3208	Residuum oil flow rate
6	FIC3209	Wax oil flow rate
7	FIC3109	Bottom flow of fluidized steam
8	PdI3122	Riser pressure drop
9	PdIC3103	Pressure drop of regenerative slide valve
10	DI3102	Density in the riser
11	TIC3101	Riser outlet temperature
12	TIC3204	Preheating temperature of feed oil
13	FIC3111	Pre-lift steam flow
14	FIC3110	Pre-lift dry gas flow
15	PI3106	Pressure in the top of settler
16	TIC3125	The first stage of the two-stages regenerator
17	TI3126A	The bottom of first stage in the two-stages regenerator
18	TIC3102	Temperature in the second stage of the two-stages regenerator
19	PI3110	Pressure in the second stage of the two-stages regenerator
20	DI3112	Density in the second stage of the two-stages regenerator
21	FIC3122	Main air flow rate
22	TI3131A	The bottom of second stage in the two-stages regenerator

Table S2. LIMS properties selected for modeling

#	Analysis item	Unit
1	10% Distillation point	°C

2	30% Distillation point	°C
3	5% Distillation point	°C
4	50% Distillation point	°C
5	70% Distillation point	°C
6	Carbon residue content	wt.%
7	Initial boiling point	°C
8	Density	kg/m ³
9	Sulphur content	wt.%
