CHP yield prediction and optimization at Oxidation unit



Data analytics modeling

- Input CHP target @OX-1202

Process Variable in
Oxidation
- Temperature
- CHP Concentration
- Resident Time
- Excess O2

CXIDIZER OPTIMIZATION PROGRAM

CHP Prediction

CHP Prediction

Optimization

Optimization

Optimization

Optimization

Optimization

Model

- Pressure
- Feed Flow Rate
- Contaminants

- Optimize condition
- Achieve minimum by-product

Operation Advisor

[Leading]

Workflow for test run

Test run period 24 Feb- 31 Mar 23



Take sample SN-1204/5/6 (Lab update @ Friday 09:00)



Get model input value Every Monday @9:00



Generate operation advisor



Team meeting to review result in next Monday



Process condition adjust Every Monday@11:00



Team meeting to verify operation advisor Every Monday@10:00

3

Recording sheet

No.	Date	Time	Target		Oxidizer No.1										
			%CHP Ox2	SN-1205	%CHP Ox1	PHN1-TIC121002.SV			PHN1-AI121002.PV			PHN1-LIC121001.SV			
			%CHP UX2	Actual	Model	Actual	Model	Delta	Actual	Model	Delta	Actual	Model	Delta	
1	09-02-23	9:00		15.12		89.50		-	4.53			79.45			
2					SEE SE						3000				

Recording sheet

Accept

Reject

Date	Time	Target	Oxidizer No.2												
		%CHD Ov3	SN-1206	%CHP Ox2	PHN1-TIC121402.SV		PHN1-AI121402.PV			PHN1-LIC121401.SV			Status	Comment	
		%CHP UXZ	Actual	Model	Actual	Model	Delta	Actual	Model	Delta	Actual	Model	Delta		
09-02-23	9:00		30.03		86.43			4.14	-		77				
							-								
					-			1							
			Date Time %CHP Ox2	Date Time %CHP Ox2 SN-1206 Actual	Date Time SN-1206 %CHP Ox2 Actual Model	Date Time SN-1206 %CHP Ox2 PHN1 Actual Model Actual	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.S Actual Model Actual Model	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV Actual Model Actual Model Delta	DateTimeSN-1206%CHP Ox2PHN1-TIC121402.SVPHN1ActualModelActualModelDeltaActual	Date SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-Al121402.F Actual Model Actual Model Delta Actual Model	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-Al121402.PV Actual Model Actual Model Delta Actual Model Delta	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-Al121402.PV PHN1 Actual Model Actual Model Delta Actual Model Delta Actual	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-AI121402.PV PHN1-LIC121401.S PHN1-AI121402.PV PHN1-AI12140	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-AI121402.PV PHN1-LIC121401.SV Actual Model Actual Model Delta Actual Model Delta Actual Model Delta	Date Time SN-1206 %CHP Ox2 PHN1-TIC121402.SV PHN1-Al121402.PV PHN1-LIC121401.SV Status Actual Model Actual Model Delta Actual Model Delta Actual Model Delta

Model achievement tracking



1st suggestion



SN-1205: CHP 14.67% SN-1206: CHP 29.24%

#Get manual input inputChpTarget = 29

#Config bnds #Hard bnds airDefBnd = 1000 L1Limit= 86 levelDefBnd = 1 L2limit = 86

tempDefBnd = 1

#Hard bnds L1Limit= 86 L2limit = 86 O2ExcessLimit =2-6

AirFlowLimit = 24900

#Production rate constraint Level Frac. feed tank > 58%

Adjusting parameters	Actual	Model	Delta	Unit
Excess O2 OX1	4.44	4.87	0.43	%
Excess O2 OX2	4.02	4.45	0.43	%
Air OX1	22805.28	23805.28	1000	Nm3/h
Air OX2	24881	24560.2	-320.8	Nm3./h
Reactor temperature OX1	90.05	89.05	-1	C
Reactor temperature OX2	87.24	86.24	-1	C
Reactor Level Controller OX1	78.2	79.2	1	%
Reactor Level Controller OX2	77.31	78.31	1	%
Reactor Level Indicator OX1	83.58	84.58	1	%
Reactor Level Indicator OX2	84.62	85.62	1	%

2nd suggestion



SN-1205: CHP 14.66% SN-1206: CHP 28.744%

#Get manual input inputChpTarget = 29.3

#Config bnds #Hard bnds airDefBnd = 1000 L1Limit= 86 levelDefBnd = 1 L2limit = 86 tempDefBnd =0.5 O2ExcessLi

#Hard bnds
L1Limit= 86
L2limit = 86
O2ExcessLimit = 2-6
AirFlowLimit = 24900

#Production rate constraint Level Frac. feed tank > 58%

Adjusting parameters	Actual	Model	Delta	Unit
Excess O2 OX1	4.85	4.76	-0.09	%
Excess O2 OX2	4.16	4.42	0.26	%
Air OX1	23446.25	22446.25	-1000.00	Nm3/h
Air OX2	24854.21	24900	45.79	Nm3./h
Reactor temperature OX1	89.74	89.24	-0.50	C
Reactor temperature OX2	87.06	86.56	-0.50	C
Reactor Level Controller OX1	81.22	82.22	1.00	%
Reactor Level Controller OX2	78.87	79.57	0.70	%
Reactor Level Indicator OX1	84.88	85.88	1.00	%
Reactor Level Indicator OX2	85.30	86	0.70	%

20 Feb 2022 10:00

1st suggestion



SN-1205: CHP 14.67% SN-1206: CHP 29.24%

#Get manual input inputChpTarget = 29

#Config bnds airDefBnd = 300 levelDefBnd = 1 tempDefBnd = 1 #Hard bnds L1Limit= 86 L2limit = 86 O2ExcessLimit = 2-6 AirFlowLimit = 24900

#Production rate constraint Level Frac. feed tank > 58%

Current

Excess O2 OX1 = 4.44

Excess O2 OX2 = 4.02

Reactor temperature OX1 = 90.05

Reactor temperature OX2 = 87.24

Reactor Level OX1 = 78.2

Reactor Level OX2 = 77.31

Suggestions

Excess O2 OX1 = 4.66

Excess O2 OX2 = 4.45

Reactor temperature OX1 = 89.05

Reactor temperature OX2 = 86.24

Reactor Level OX1 = 79.2

Reactor Level OX2 = 78.31

Delta

Excess O2 OX1 = 0.22

Excess O2 OX2 = 0.44

Reactor temperature OX1 = -1.0

Reactor temperature OX2 = -1.0

Reactor Level controller OX1 = 1.0

Department and appropriate OVO = 10