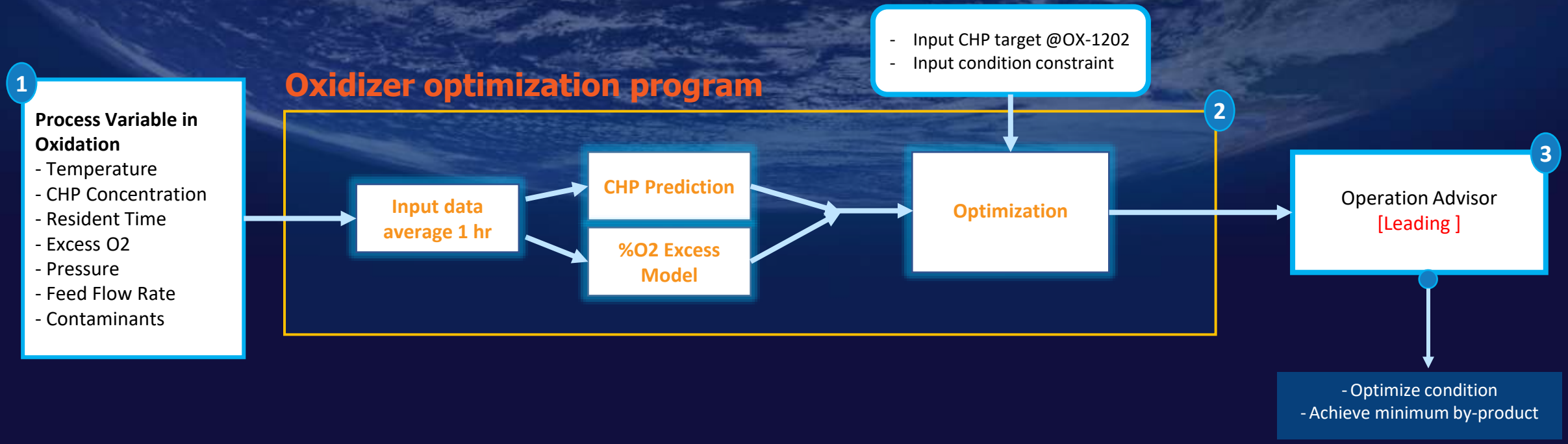
# CHP yield prediction and optimization at Oxidation unit

1

# Data analytics modeling



2

# 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

# Recording sheet

| No. | Date | Time | Target | Oxidizer No.1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | %CHP Ox2 | SN-1205 | %CHP Ox1 | PHN1-TIC121002.SV | | | PHN1-AI121002.PV | | | PHN1-LIC121001.SV | | |
| | | | | 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 | | | | | | | | | | | | | | |
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Record FIC130401 (fix)

Oxidizer No.1

4

# Recording sheet

| No. | Date | Time | Target | Oxidizer No.2 | | | | | | | | | | Status | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | %CHP Ox2 | SN-1206 | %CHP Ox2 | PHN1-TIC121402.SV | | | PHN1-AI121402.PV | | | PHN1-LIC121401.SV | | | | | |
| | | | | Actual | Model | Actual | Model | Delta | Actual | Model | Delta | Actual | Model | Delta | | |
| 1 | 09-02-23 | 9:00 | | 30.03 | | 86.43 | | | 4.14 | | | 77 | | | | |
| 2 | | | | | | | | | | | | | | | | |
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Accept

Reject

Oxidizer No.2

# Model achievement tracking

6

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 = 1000
levelDefBnd = 1
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 | % |

6

27 Feb 2022 10:00

# 2nd suggestion

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

#Get manual input
inputChpTarget = 29.3

#Config bnds
airDefBnd = 1000
levelDefBnd = 1
tempDefBnd =0.5

#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 | % |

6

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