Functional Design Specification for Advanced Process Controller APC-J143_LIC_002_004C

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Executive Summary

This document is the Functional Design Specification (FDS) for the Advanced Process Controller (APC) that is being implemented. The document is structured into the following six sections:

Section 1 is a process background and description the process whereby the APC controller will be implemented. Based on the S88 standard, the process descriptions are covered.Also included are the stability and efficiency measures on the each unit which drive APC systems to align with Anglo American strategy.

Section 2 is an explanation of the basic control philosophy of the process unit.

Section 3 is a detailed explanation of the APC controller, including descriptions of the control, manipulated and disturbance variables as well as the controller objectives and key performance indicators (KPI's). This section also describes the logic for the detection of the four types of plant process state alarms which are; critical, high, low and default.

Section 4 (optional) is a description of the control technologies that will be used in the implementation of the APC controller. The control technologies are Fuzzy Control and Model Predictive Control (MPC).

Section 5 (optional) is a list of the heartbeats.

Section 6 (optional) is a list of all the tags that will be used in the implementation of the DMS Feed process unit APC controller.

Addendums (optional) is the final section of the document which is an explanation of the basic principles of operations for Process States, Fuzzy Control, Model Based Control and finally Model Predictive Control.

1) Process Background And Description

1.1) SIS-JIG (Site)

1.1.1) Background

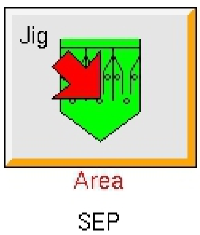


Fig 1: The members of the SIS-JIG Site - Highlighting the Jig-Area - SEP

1.2) SEP (Jig-Area)

1.2.1) Background

The jig plant at Sishen Iron Ore Mine consists of a primary, secondary and tertiary crushing circuit crushing the feed material to a -25 mm top size and longitudinally stacking it on two ROM (run of mine) feed beds. The ROM feed bed material is reclaimed by a bucket reclaimer and conveyed to eight feed bunkers.

After beneficiation the lumpy ore (-25 mm +8 mm) is conveyed and stacked on the blending beds while the fine material (-8 mm +1 mm) is conveyed to the dewatering bunkers and then stacked on the fine blending beds. The jig plant consist of eight modules with three jigs each, the coarse jig (-25 mm +8 mm), medium jig (-8 mm +3 mm) and fine jig (-3 mm +1 mm).

Jigging is a process of particle stratification in which the particle rearrangement results from an alternate expansion and compaction of a bed of particles by a pulsating fluid flow. The rearrangement results in layers of particles that are arranged by increasing density from top to bottom of the jig bed. The particles, in addition to the vertically expanded and compacted bed motion, move continuously and horizontally across the supporting jig screen helped by the feed material that is introduced at one end. The feed rate influences the retention time of the material in the jig and thus the number of pulses the material will receive. Following the particle stratification, the particle bed is physically cut at a desired horizontal particle density plane to separate the desired product from the less dense gangue material.

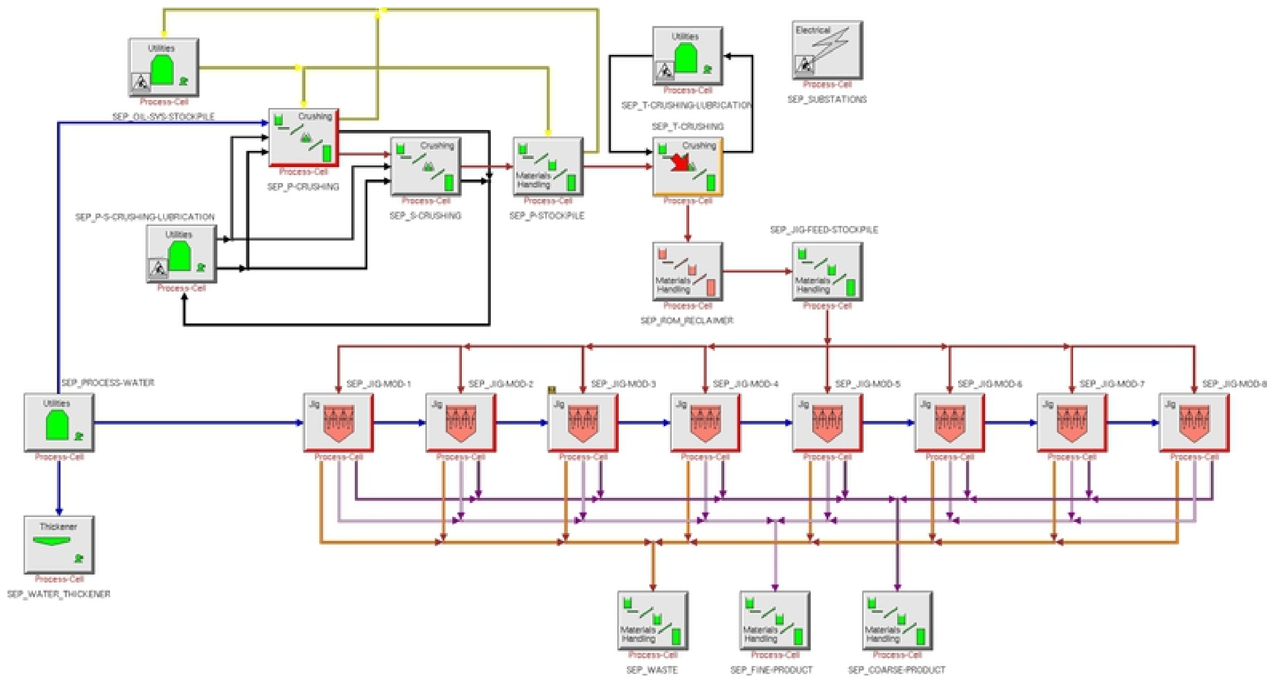


Fig 2: The members of the SEP Jig-Area - Highlighting the Crushing-Process-Cell - T-CRUSHING

1.3) T-CRUSHING (Crushing-Process-Cell)

1.3.1) Background

The tertiary crusher stage is fed from the primary stockpile, which contains the primary and secondary crusher product. The tertiary crushing plant consists of four tertiary cone crushers, each of which are fed at a controlled rate through a feed bin, two feeders per crusher. The tertiary crushing plant is in closed circuit and produces a -25mm which is conveyed to one of two pre-blending beds, these beds are fed to the beneficiation process (jigging).

1.3.2) Purpose

1.3.3) Theory

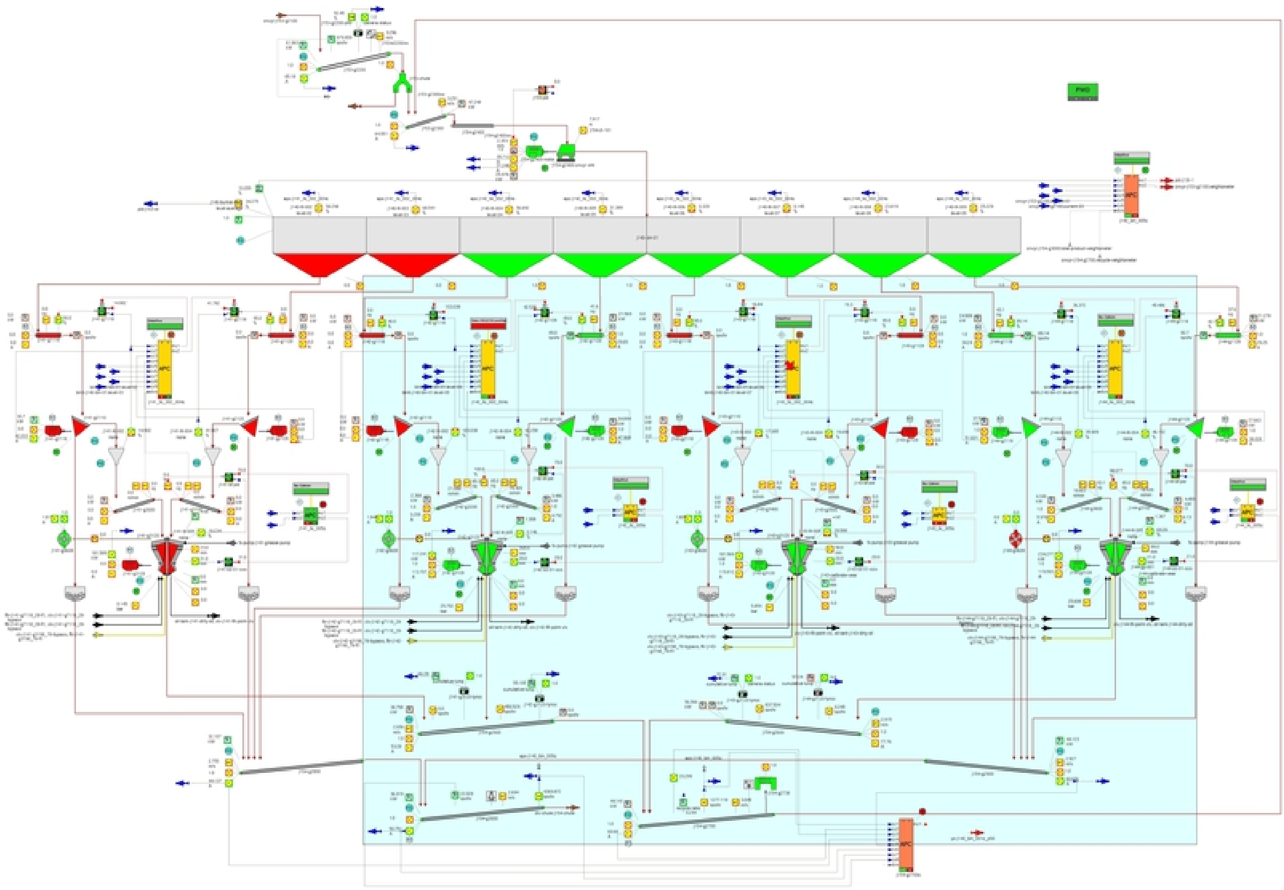


Fig 3: The members of the CRUSHER-03-FEED unit which is a member of T-CRUSHING Crushing-Process-Cell - Highlighting J143_LIC_002_004C

1.4) CRUSHER-03-FEED (Unit)

1.4.1) Background

The secondary crusher (J120-G3100) output reports to the primary stockpile (J130-ST-01) which reports to the tertiary crusher feed bin (J140-BIN-01) via the tertiary crusher feed bin conveyor (J153-G2100). For each crusher unit there are two variable speed vibrating feeders (J143-G1118 and J143-G1128) withdrawing material from the tertiary crusher feed bin (J140-BIN-01). These feeders feed screens (J143-G2110 and J143-G2120) which separates the oversize from the undersize. The -25mm reports to J154-G3000 which will feed the JIG feed stockpile. The +25mm ore reports to chutes (J143-G2110-CHUTE and J143-G2120-CHUTE) which in turns feed the tertiary crusher (J143-G3120) via two variable speed conveyors (J143-G3400 and J143-G3500).

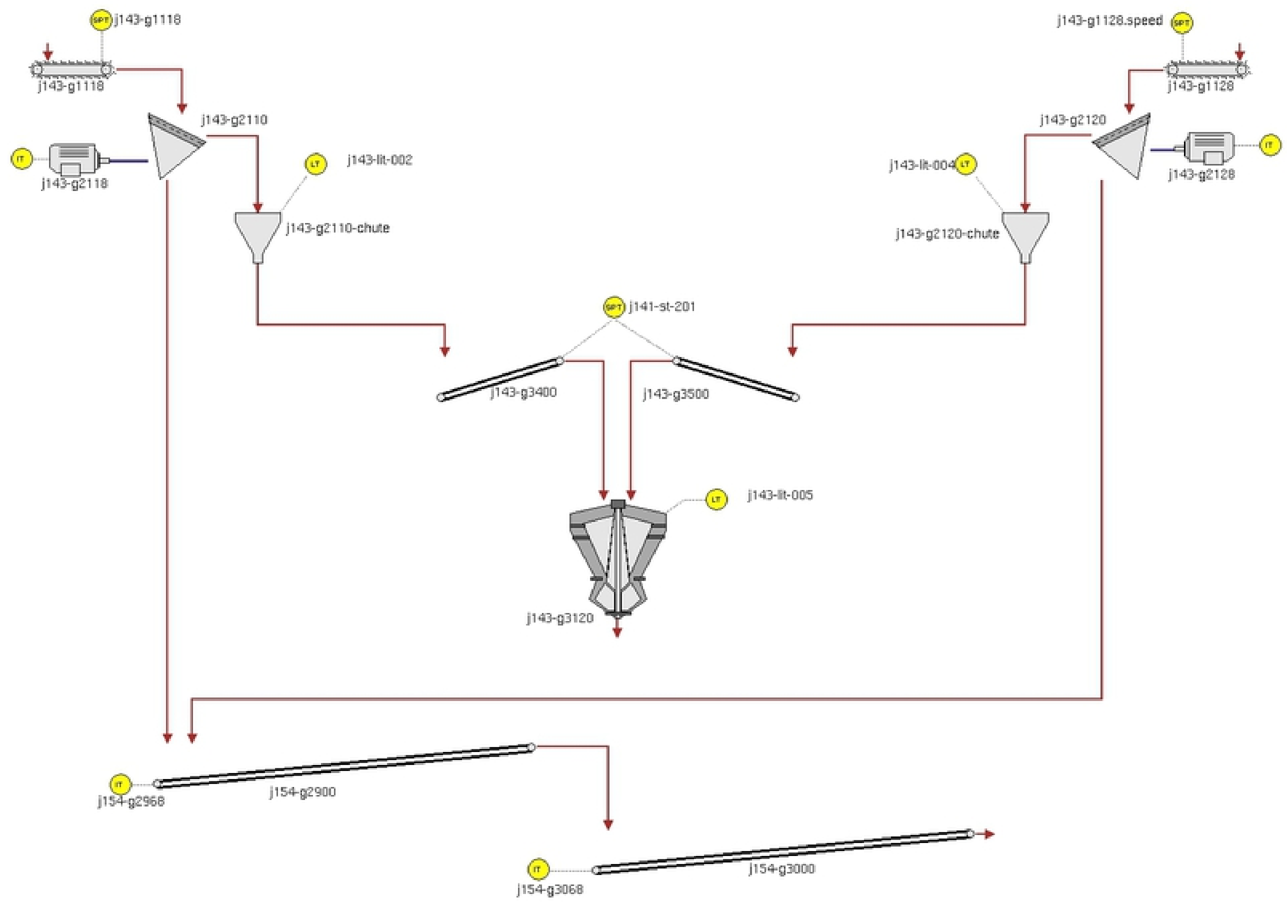


Fig 4: Relevant Circuit Schematic

1.4.2) Measures

1.4.2.1) Scrn-J143-G2110: Measure: Nr-Starts

Nr-Starts Measure							
Measure	Goal	EU	Owner	Key Performance Indicator (KPI)?	Lower Control Limit (LCL)	Target Value	Upper Control Limit (UCL)
NR-STARTS	MINIMIZE		APC-CUSTODIAN	false	0	0	10

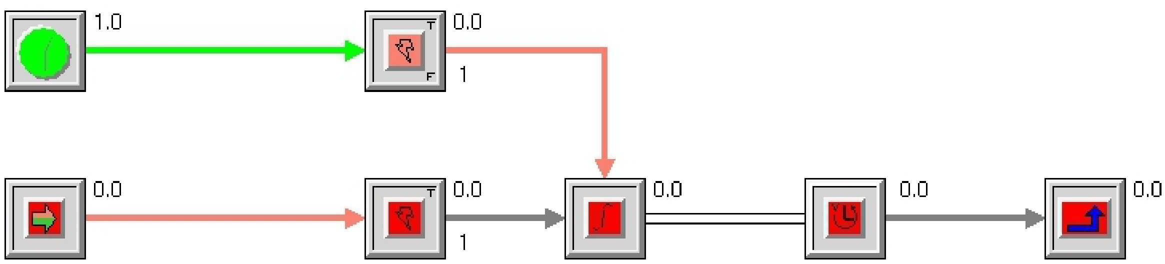


Fig 5: Determining Nr-Starts

1.4.2.2) Scrn-J143-G2120: Measure: Nr-Starts

Nr-Starts Measure

Measure	Goal	EU	Owner	Key Performance Indicator (KPI)?	Lower Control Limit (LCL)	Target Value	Upper Control Limit (UCL)
NR-STARTS	MINIMIZE		APC-CUSTODIAN	false	0	0	10

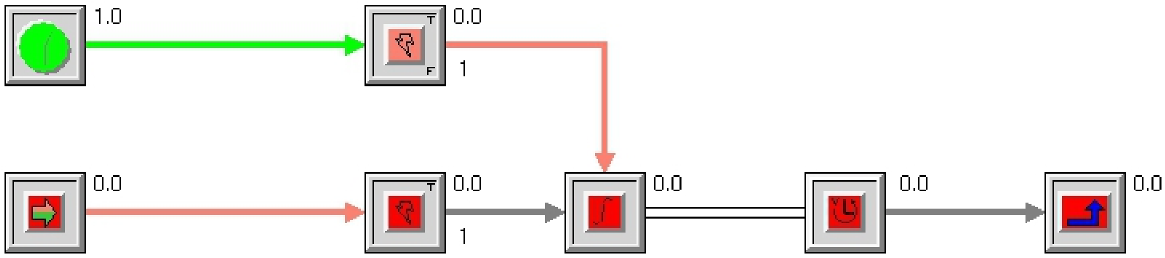


Fig 6: Determining Nr-Starts

2) Basic Control

2.1) Description

Two base layer PID controllers one for each transfer shoot (J143-G2110-CHUTE and J143-G2120-CHUTE) each manipulating the speed of the apron feeders (J143-G1118 and J143-G1128) from the tertiary crusher feed bin into the specific transfer chute.
These vibrating feeders (J143-G1118 and J143-G1128) will be interlocked by the tertiary crusher feed bin (J140-BIN-01) level limits (as configured in the PLC), stopping the feeders at the low-low bin level limits. When the tertiary crusher feed bin level reaches the high-high bin level limits, the feeder speeds will be increased.
These vibrating feeders (J143-G1118 and J143-G1128) will be interlocked by their respective chutes (J143-G2110-CHUTE and J143-G2120-CHUTE) level limits (as configured in the PLC), stopping the feeders at the high-high chute level limits. When the tertiary crusher feed chutes (J143-G2110-CHUTE and J143-G2120-CHUTE) level reaches the low-low bin level limits, the feeder speeds will be increased.

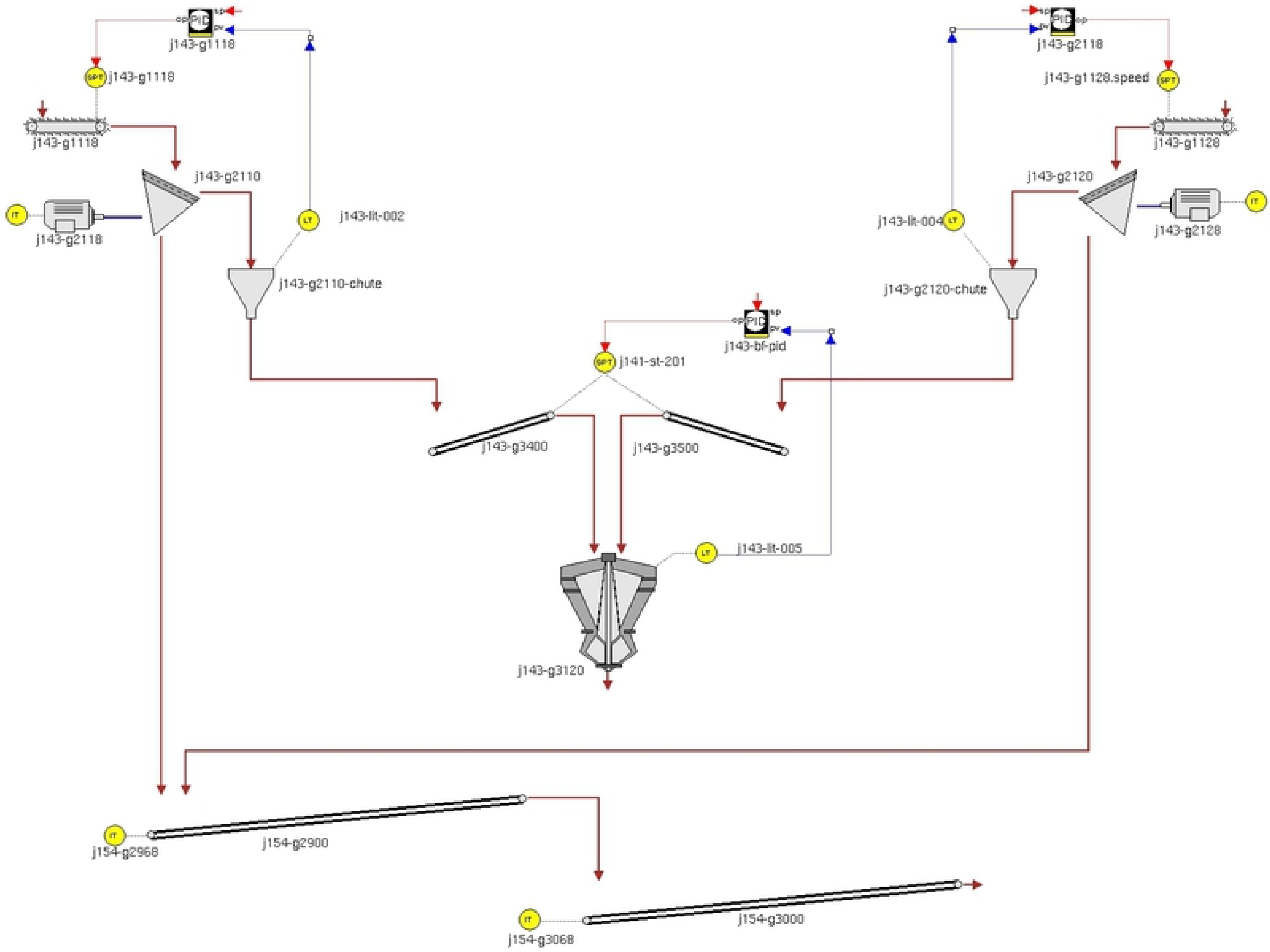


Fig 7: Circuit with Basic Control

2.2) PID Tuning Parameters

PID Tuning			
Controller ID	P	I	D
J143-G1118	0.30	20000.00	0.00
J143-G2118	0.26	88000.00	0.00
J143-BF-PID	0.26	88000.00	0.00

3) ADVANCED CONTROL

3.1) Description

The advanced control layer makes use of a fuzzy logic rule-based algorithm and model predictive control that utilizes the tertiary crusher's variable speed feeder 1 (J143-G1118) AND the tertiary crusher's variable feeder 2 (J143-G1128.SPEED) feeding from the tertiary crusher feed bin (J140-BIN-01) to control the chute 1 level (J143-LIT-002), screen 1 current (**The objective of the advanced process controller (J143_LIC_002_004C) is to optimize the feed rate to the screens (J143-G2110 and J143-G2120) and transfer chutes (J143-G2110-CHUTE and J143-G2120-CHUTE) via the tertiary crusher feed bin feeders (J143-G1118 and J143-G1128) without overloading the -25mm conveyors (J154-G2900 and J154-G3000).**

Additional Controller Logic

Additional control logic is added to set the vibrating feeder speed (J143-G1118) to max when the level in chute (J143-G2110-CHUTE) is below its low limit. The same logic was also added to set the vibrating feeder speed (J143-G1128.SPEED) to max when the level in chute (J143-G2120-CHUTE) is below its low limit. As soon as the level in the chutes (J143-G2110-CHUTE) and (J143-G2120-CHUTE) are above the low limit, the MPC is allowed to take over and control the level between its limits.

Logic have also been added to start reducing the feeder speed, if the chute level is above 35 % and the chute level rate of change is posetive, by 2 %, however if the MPC wants to reduce the speed by more than 2 %, the MPC change will be accepted.

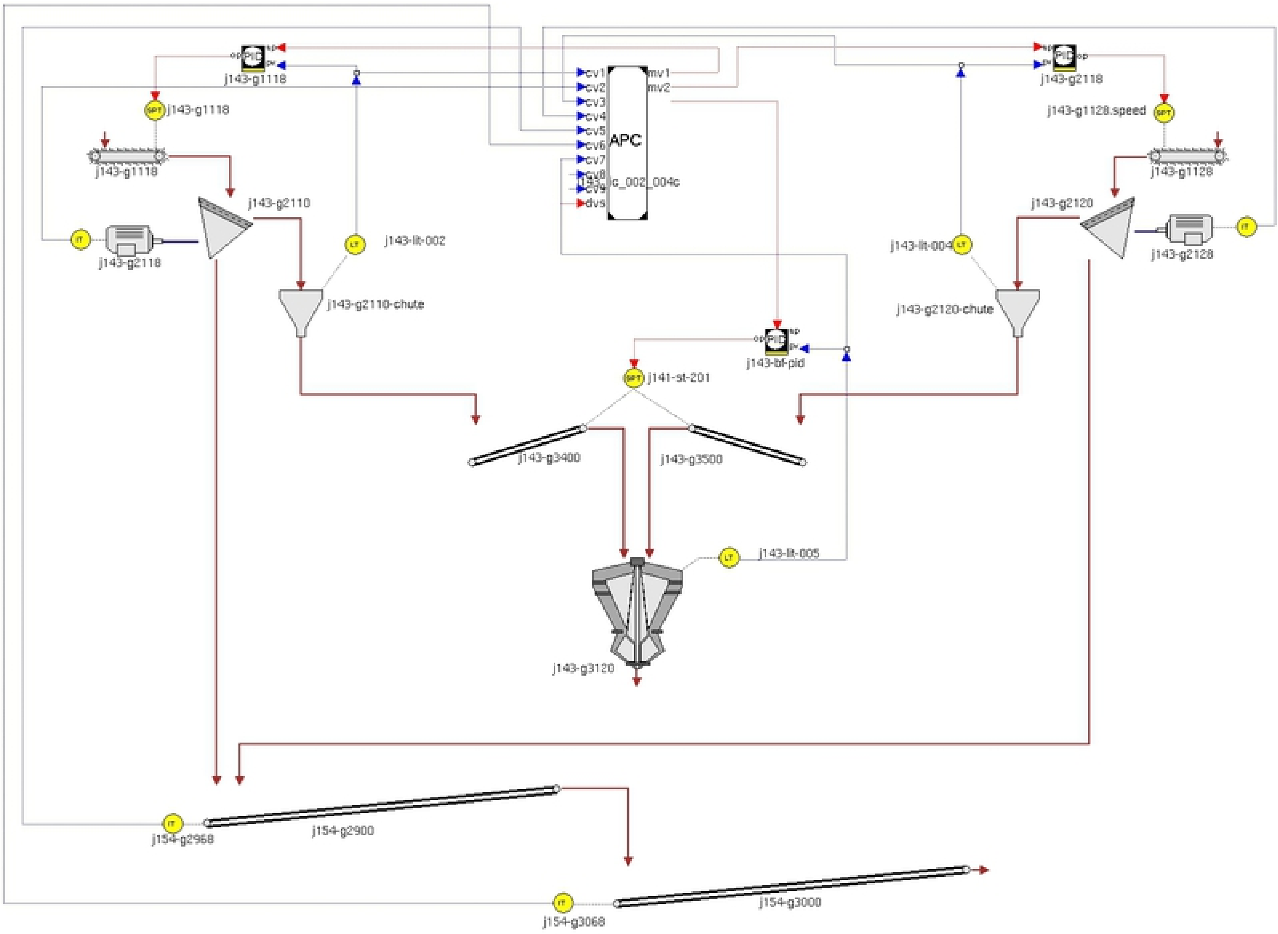


Fig 8: Circuit with Advanced Control

3.2) Controlled Variables

The first process variable is the first transfer chute level reading (J143-LIT-002).

A high level indicates that the chute capacity is almost at its max and that the feeder (Feeder J143-G1118) should be sped down.

The process controlled variable is the first screen current (J143-G2118). Higher screen current indicates an increased load to the screen (J143-G2110), the higher load means that most of the materials on the screen are +25mm and will be transferred to the transfer chute (J143-G2110-CHUTE).

The third process variable is the second transfer chute level reading (J143-LIT-004).
A high level indicates that the chute (J143-G2120-CHUTE) capacity is almost at its max and that the feeder (J143-G1128) should be sped down.
The fourth process variable is the second screen current (J143-G2128). Higher screen current indicates an increased load to the screen (J143-G2120), the higher load means that most of the materials on the screen are +25mm and will be transferred to the transfer chute (J143-G2120-CHUTE).
The fifth process variable is the screens (J143-G2110 and J143-G2120) undersize (-25mm) conveyor current (J154-G2968) , a high current indicates that the ore fed to the screens consists mostly of undersize as the conveyor (J154-G2900) will be over loaded.
The sixth process variable is the JIG stockpile feed conveyor current (J154-G3068), a high current indicates that the ore fed to the screens consists mostly of undersize as the conveyor (J154-G3000) will be over loaded.
The seventh process variable is the crusher cavity level (154-G3000). The crusher cavity level is available as a controlled variable in case the crusher cavity level PID () is not able to maintain the level successfully. Crusher cavity level (154-G3000) is essential to achieve choke feed conditions. Note that when the Crusher cavity level (154-G3000) is controlled by the APC it will not be available as a manipulated variable.

The following table lists the relevant controlled variables for this controller along with their engineering units and control limits. Note that these control limits can be adjusted from the SCADA faceplate

APC CVs for APC-J143_LIC_002_004C				
Description	ID	EU	Low	High
CV1: T-Crusher-1 J141-Rockbox-5 Level	J143-LIT-002	%	25.00	62.00
CV2: Screen Motor J143-G2118 Current	J143-G2118	A	25.00	67.00
CV3: T-Crusher-1 J141-Rockbox-6 Level	J143-LIT-004	%	25.00	62.00
CV4: Screen Motor J143-G2128 Current	J143-G2128	A	25.00	67.00
CV5: Tertiary Crusher Conveyor J154-G2900 Current	J154-G2968	A	0.00	88.40
CV6: Tertiary Crusher Conveyor J154-G3000 Current	J154-G3068	A	0.00	78.70
CV7: Tertiary Crusher Conveyor J154-G3000 Total-Product-Weightometer	154-G3000	ton/hr	0.00	5000.00
CV8: T-Crushing Feed Bin J154-BIN-01 Level-06	J140-LIT-006	%	20.00	70.00
CV9: T-Crushing Feed Bin J154-BIN-01 Level-07	J140-LIT-007	%	20.00	70.00

3.3) Manipulated Variables

The first controlled variable is the speed controller (J143-G1118) setpoint which will write to the speed PID (T-Crusher-1 J141-Rockbox-5 Level PID-Controller J143-G1118) setpoint. This PID controller will manipulate the speed of the feeder (J143-G1118) feeding the screen (J143-G2110).
The second controlled variable is the speed controller (J143-G2118) setpoint which will write to the speed PID (T-Crusher-1 J141-Rockbox-6 Level PID-Controller J143-G2118) setpoint. This PID controller will manipulate the speed of the feeder (J143-G1128) feeding the screen (J143-G2110).

The following table lists the relevant manipulated variables for this controller along with their engineering units and control limits. Note that these control limits can be adjusted from the SCADA faceplate

APC MVs for APC-J143_LIC_002_004C				
Description	ID	EU	Low	High
MV1: Feeder J143-G1118	J143-G1118	%	40.00	95.00
MV2: Feeder J143-G1128	J143-G1128	%	40.00	95.00

3.4) Disturbance Variables

The following table lists the relevant disturbance variables for this controller along with their engineering units.

APC DVs for APC-J143_LIC_002_004C		
Description	ID	EU
DV1: Conveyor J143-G3400 Hz-Speed	J143-ST-101	Hz
DV2: Conveyor J143-G3500 Hz-Speed	J143-ST-201	Hz

3.5) Objectives and KPI's

Objectives For Apc-J143_Lic_002_004c				
Measure	Goal	Owner	KPI	Weight

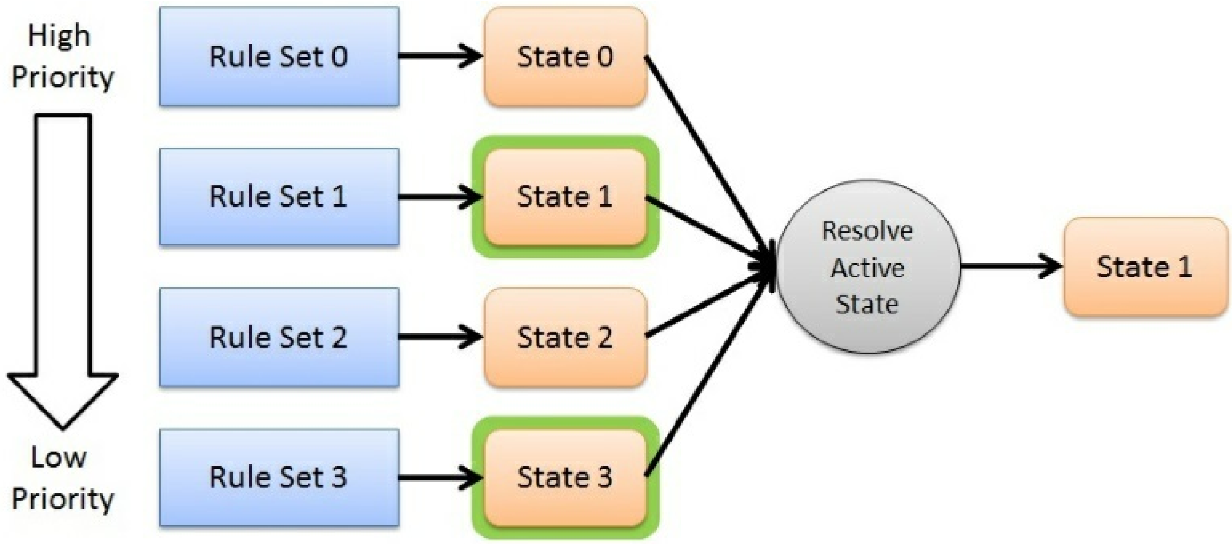
3.6) Process States

In APET, control philosophies are built around the state of the process. Different process conditions (broadly speaking) require different actions to be taken to achieve performance targets. In APET, process states are resolved through graphical rules and used in a hierarchical bidding system to determine the current process state. The governing state is then used in deciding which control scheme to implement.

These two steps are briefly described below.

1) Active State Resolution

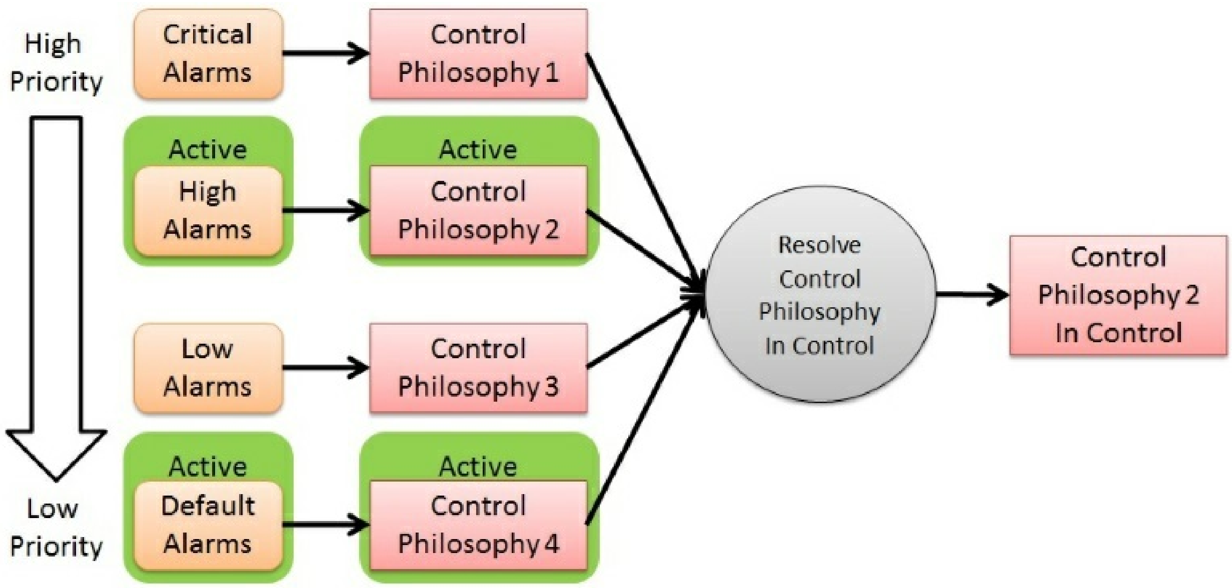
Each state is determined by a set of rules. These are usually built up using graphical rules and may monitor any information available within the APET application. A state is considered active if all specified conditions are met. This means that it is possible the more than one state can be active at a time. To deal with this, states are ranked based on a priority, so that the active state with the highest priority becomes the in-control state.



Because it is also possible that no states are active, it is important to select a state that acts as the default state. The default state usually corresponds to the state with the lowest priority (default alarms).

2) Control Philosophy Resolution

Each state corresponds to a specific control philosophy that will be implemented. Once the active state has been determined, the corresponding control philosophy is activated.



There are always 4 controller states for every APC controller in APET. These controller states are grouped together as follows:

1. Critical Alarms
2. High Alarms

3. Low Alarms
4. Default Alarms
Each of these 4 controller states may containing at least one referencing state. For example, the Default Alarms container will contain the MPC optimizer and default states amongst others.
Based on the referenced states of each controller state, the State Index of the controller state may be:
0 if it is not active
1 active but not in-control
2 active AND in-control
All of the attributes of the controller states are display on the SCADA faceplate.

3.6.1) CRITICAL-ALARMS

The following CRITICAL-ALARMS are defined:

3.6.1.1) Chute-J143-G2110-Level-High

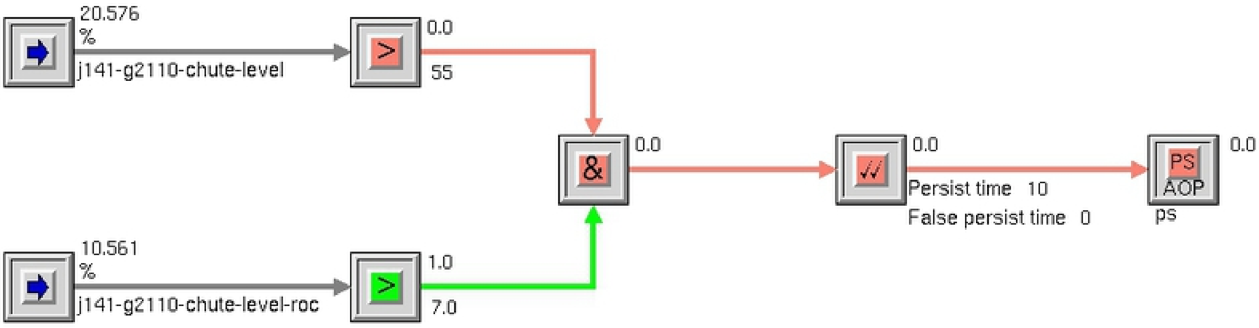


Fig 9: Determining Chute-J143-G2110-Level-High

3.6.1.2) Chute-J143-G2120-Level-High

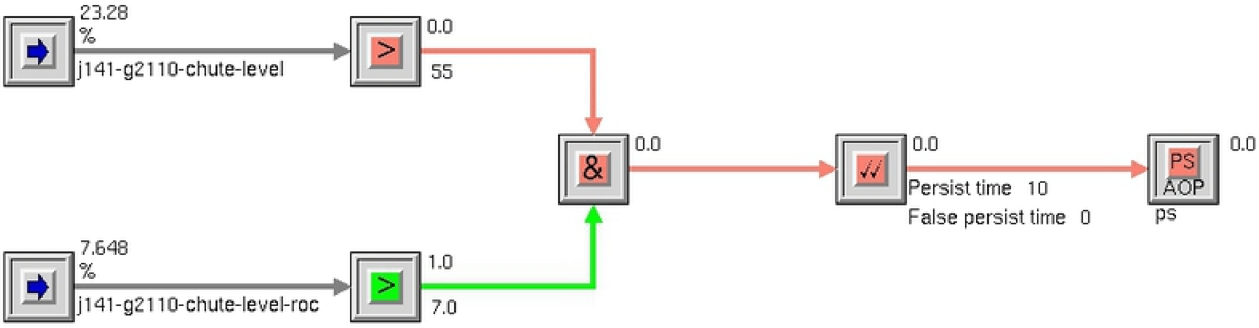


Fig 10: Determining Chute-J143-G2120-Level-High

3.6.2) HIGH-ALARMS

The following HIGH-ALARMS are defined:

3.6.2.1) Chute-J143-G2110-Level-Low

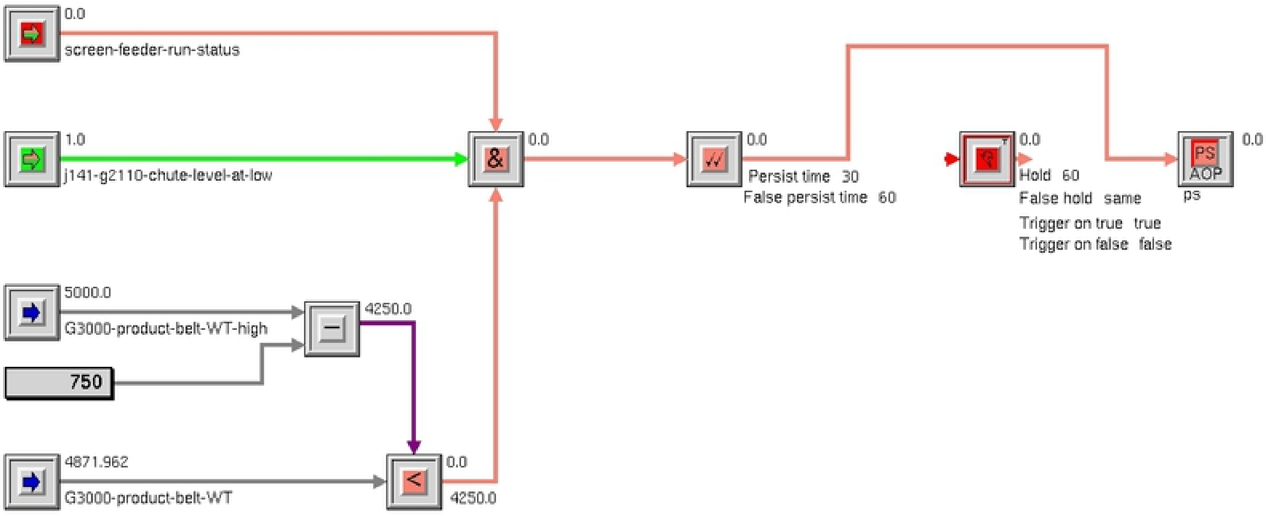


Fig 11: Determining Chute-J143-G2110-Level-Low

3.6.2.2) Chute-J143-G2120-Level-Low

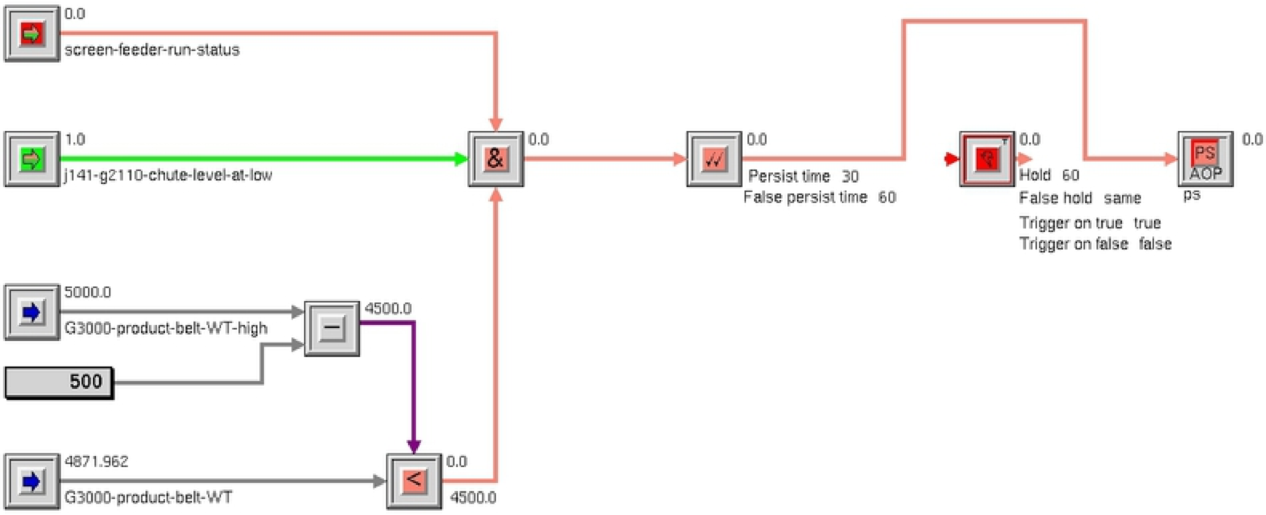


Fig 12: Determining Chute-J143-G2120-Level-Low

3.6.2.3) Conveyor-154-G3000-Constrained

This process state determines if the JIG feed stockpile conveyor (J154-G3000) current (J154-G3068) is constrained. This process state becomes true when the JIG feed stockpile conveyor current (J154-G3068) reaches a high limit as set on the SCADA face plate.
While this state is true the tertiary crusher feeders speed (J141-G1118.SPEED and J141-G1128.SPEED) must be decreased. This will decrease the feed to the two screens (J141-G2110 and J141-G2120) and reduce the feed to the conveyor (J154-G3000).

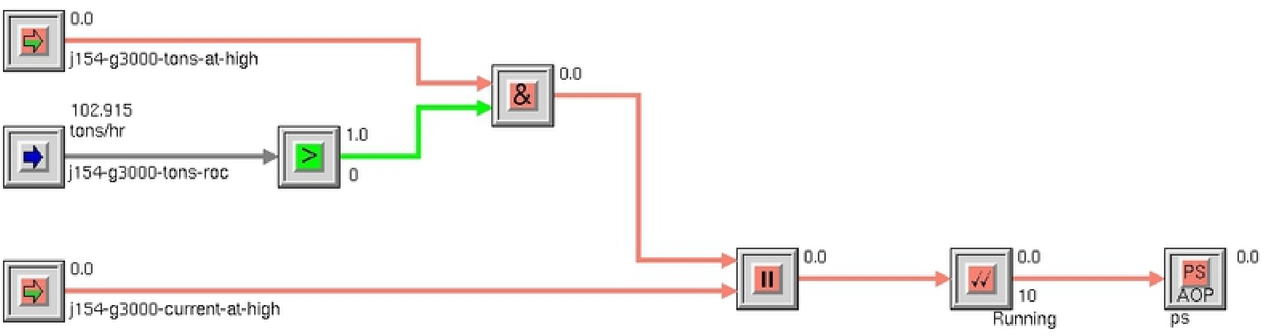


Fig 13: Determining Conveyor-154-G3000-Constrained

3.6.2.4) Conveyor-154-G2900-Constrained

This process state becomes true when the conveyor motor current reaches the high limit set on the APC faceplate for at least 10 second. While this state is true, the controller will revert to default control and the MPC controller will be switched off.
Conveyor high current and load are unwanted process states, this means that the feed to the screens consists mainly of material below -25mm and goes directly to the conveyor.

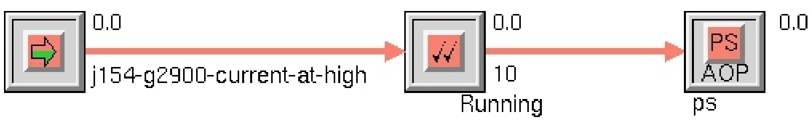


Fig 14: Determining Conveyor-154-G2900-Constrained

3.6.3) LOW-ALARMS

The following LOW-ALARMS are defined:

3.6.3.1) Screen-J143-G2120-Constrained

This process state becomes true when the screen motor current reaches the high limit set on the APC faceplate for at least 20 seconds. While this state is true, the controller will revert to default control and the MPC controller will be switched off.
Screen high motor current is an unwanted process state, this means that the feed to the screen consists mainly of material above +25mm and goes directly to the transfer chute to the crusher.

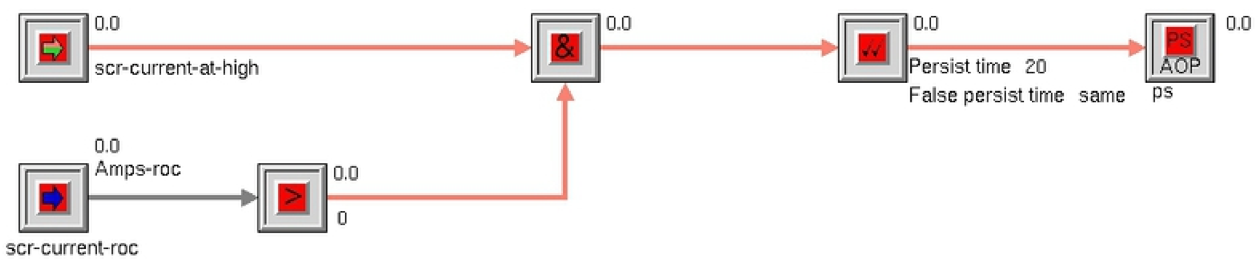


Fig 15: Determining Screen-J143-G2120-Constrained

3.6.3.2) Screen-J143-G2110-Constrained

This process state becomes true when the screen motor current reaches the high limit set on the APC faceplate for at least 20 seconds. While this state is true, the controller will revert to default control and the MPC controller will be

switched off.
Screen high motor current is an unwanted process state, this means that the feed to the screen consists mainly of material above +25mm and goes directly to the transfer chute to the crusher.

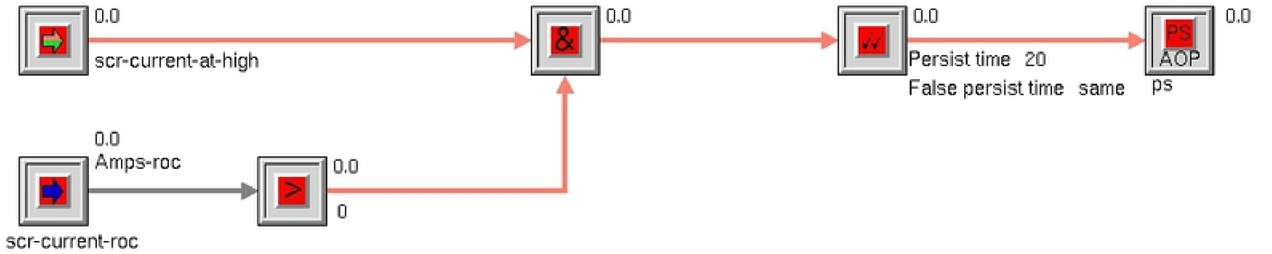


Fig 16: Determining Screen-J143-G2110-Constrained

3.6.4) DEFAULT-ALARMS

The following DEFAULT-ALARMS are defined:

3.6.4.1) Mpc-Optimizer

Discrete logic ensuring that:
the operator request is ON;
the MPC controller is switched ON; and
the communications between the MPC and APET are OK (HB healty).
Note that the MPC optimizer state will be true (Active) if the logic above is true. The MPC optimizer will be In Control if none of the higher priority states are true.

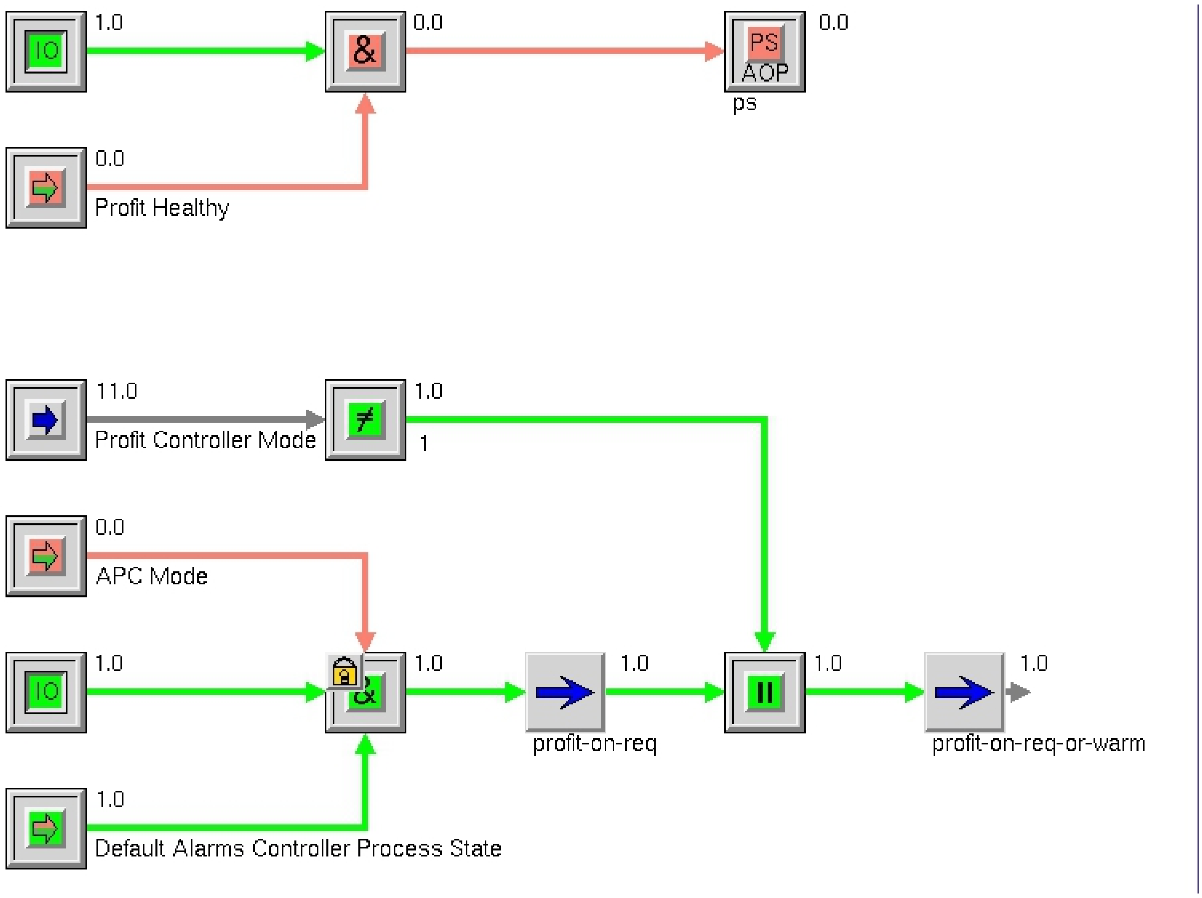


Fig 17: Determining Mpc-Optimizer

3.6.4.2) Default-Root

This process state determines if the crusher bin level is above 40.0%. When the Secondary Crusher feed bin lelel is high, the APC controller should not attempt to make CSS changes to Crusher 1 (Belief = 0.5) . The reason being that once a new CSS SP is written to the PLC, the Crusher Feeder will be I/Locked, which will cause the bin level High High Limit to be reached. This will I/Lock all the conveyors upstream in a cascade mode, which will result in a ZERO production scenario. Zero production is worse than production at a less than optimal Lump:Fine Ratio.

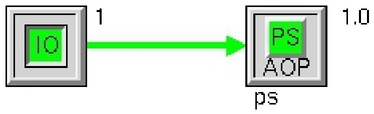


Fig 18: Determining Default-Root

3.7) Interlocks

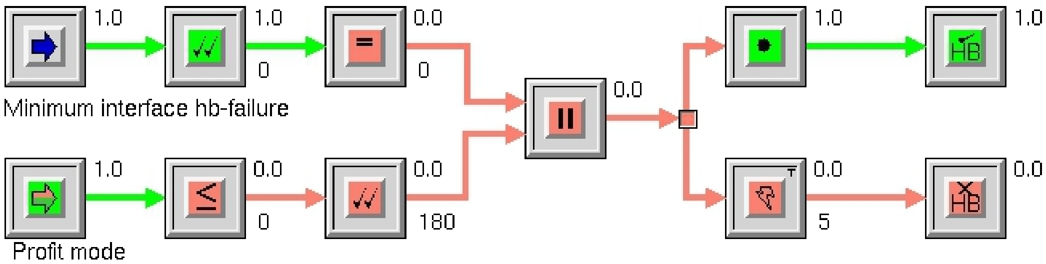


Fig 19: Interlocks: Apc-J143_Lic_002_004c.interlocks

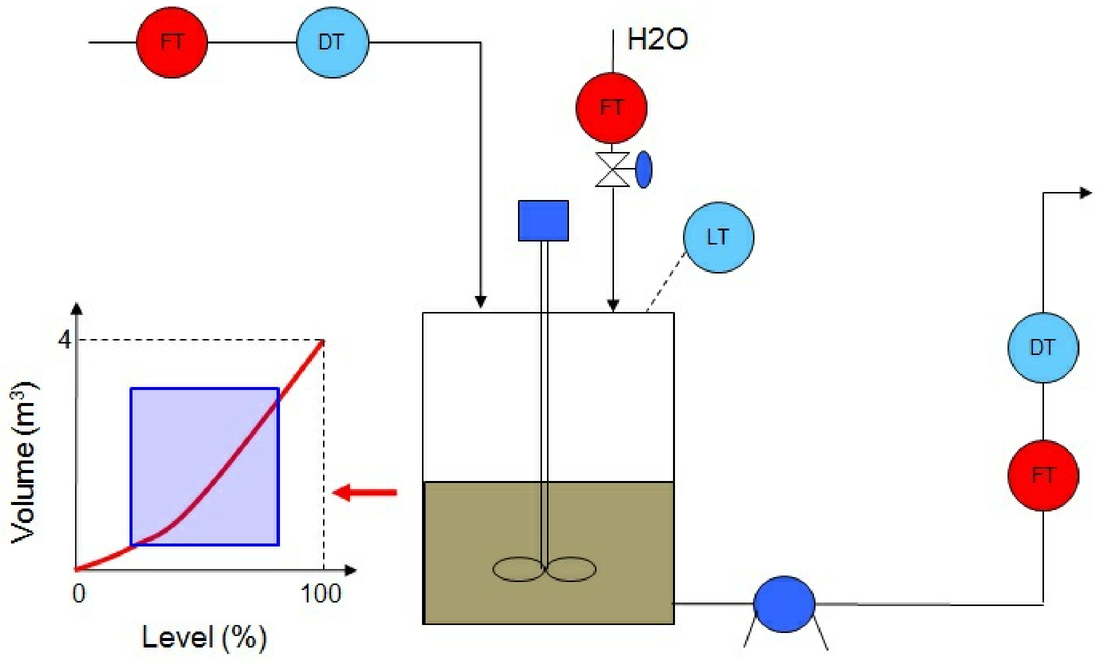
4) Control Technologies

Model predictive control (MPC) is an advanced method of process control that has been in use in the process industries in chemical plants and oil refineries since the 1980s. Model predictive controllers rely on dynamic models of the process, most often linear empirical models obtained by system identification. Dynamic process models describe how the process parameters will respond in the future for changes made to the process in the present time. These models can therefore predict process responses into the future. The main advantage of MPC is the fact that it allows for the current process conditions (current timeslot) to be optimized, while accounting for future process conditions (future timeslots) still to happen as a result of changes to the current process conditions. This is achieved by optimizing over a finite time-horizon (the future predictions), implementing the current timeslot actions and then relying on feedback to account for unmeasured disturbances and model/plant mismatches. This implies that the model prediction error that may exist (or develop over time) is also taken into account by the MPC algorithm. MPC models therefore do not have to be 100% accurate. As a result of this the MPC technology is very robust, and typically outperforms most other advanced process control techniques. The MPC further has the ability to anticipate/predict future events and can take control actions accordingly. An example of this is that the MPC can predict that the bin level will drop below the low level limit, which will result in the feeder being interlocked and stopped. The feeder stop will again cause the bin level to increase sharply. The MPC can take all of these future predictions into account and prevent this scenario from happening. PID controllers normally implemented as part of the base layer (PLC) control do not have this predictive ability. Therefore the PID controller in the base layer (PLC) control will not be able to prevent the above feeder interlock and stop.

The models used in MPC are generally intended to represent the behaviour of complex dynamic systems, which cannot be effectively controlled by base layer (PLC) controllers such as PID controllers. Dynamic characteristics that are difficult for PID controllers include large time delays, variable interaction and high-order dynamics.

MPC uses current and historical plant responses/measurements, the current dynamic state of the process, the MPC models, and the process variable targets and limits to calculate future changes in the dependent variables (the variables to be controlled, such as bin levels and product mass flowrates). These changes are calculated to hold the dependent variables close to target while honoring constraints on both independent (the levers that can be pulled by the MPC system, such as feeder speeds or PID setpoints) and dependent variables. The MPC typically sends out only the first setpoint change (of the sequence of calculated changes required going into the future) in each independent variable to be implemented, and repeats the calculation when the next change is required (by updating the sequence of calculated changes required going into the future).

Below is an image to illustrate the concepts:



In summary, Model Predictive Control (MPC) is a multivariable control algorithm that uses:

1. an internal dynamic model of the process
2. a history of past control moves and
3. an optimization cost function J over the receding prediction horizon,

to calculate the optimum control moves.

An example of a quadratic cost function for optimization is given by:

$$J = \sum_{i=1}^{N} w_{x_i}(r_i - x_i)^2 + \sum_{i=1}^{N} w_{u_i}\,\Delta u_i{}^2$$

With:

X_i = *i*-th controlled variable (e.g. measured bin level)

r_i = *i*-th reference variable (e.g. required bin level)

u_i = *i*-th manipulated variable (e.g. feeder speed)

w_{Xi} = weighting coefficient reflecting the relative importance of X_i

w_{ui} = weighting coefficient penalizing relative big changes in u_i

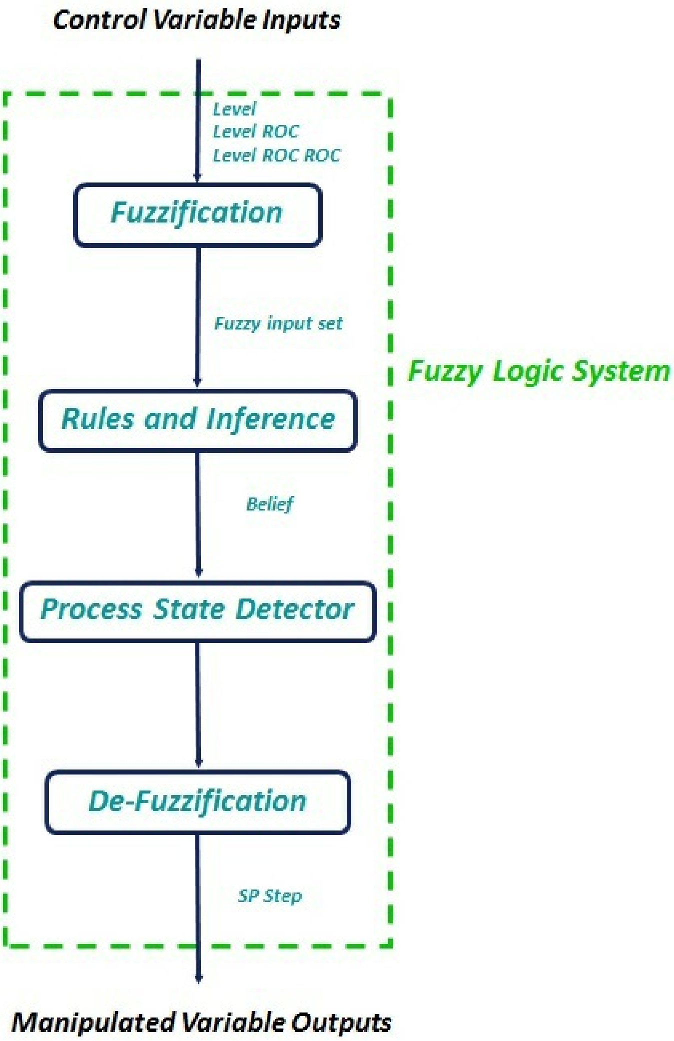
The figure below represents the model matrix for the secondary crusher model predictive controller, showing the dynamic step response between each controller input-output pair.

4.1) Expert Rule Based Control

4.2) Fuzzy Control

4.2.1) Fuzzy Sets

A fuzzy logic system (FLS) can be defined as the nonlinear mapping of an input data set to a scalar output data. A FLS consists of four main parts: fuzzifier, rules, inference engine, and defuzzifier. These components and the general architecture of a FLS is shown in the figure below.



The process of fuzzy logic is defined as follows: Firstly, a crisp set of input data are gathered and converted to a fuzzy set using fuzzy linguistic variables, fuzzy linguistic terms and membership functions. This step is known as fuzzification. Afterwards, an inference is made based on a set of rules. Lastly, the resulting fuzzy output is mapped to a crisp output using the membership functions, in the defuzzification step.

The fuzzy logic algorithm can be summarized as follows:

1. Define the linguistic variables and terms (initialization)
2. Construct the membership functions (initialization)
3. Construct the rule base (initialization)
4. Convert crisp input data to fuzzy values using the membership functions (fuzzification)
5. Evaluate the rules in the rule base (inference)
6. Combine the results of each rule (inference)
7. Convert the output data to non-fuzzy values (defuzzification)

Linguistic variables are the input or output variables of the system whose values are words or sentences from a natural language, instead of numerical values. A linguistic variable is generally decomposed into a set of linguistic terms. Example: Leven in a bin. Let level (LVL) be the linguistic variable which represents the amount of metarial in the bin. To qualify the level, terms such as high and low are used in real life. These are the linguistic values of the level. Then, LVL(t) = extremely low, low, ok, high, extremely high can be the set of decompositions for the linguistic variable level. Each member of this decomposition is called a linguistic term and can cover a portion of the overall values of the bin level.

Membership functions are used in the fuzzification and defuzzification steps of a FLS, to map the non-fuzzy input values to fuzzy linguistic terms and vice versa. A membership function is used to quantify a linguistic term. Note that, an important characteristic of fuzzy logic is that a numerical value does not have to be fuzzified using only one membership function. In other words, a value typically belongs to multiple sets at the same time. For example the bin level value can be considered as extremely low and low at the same time, with different degrees of memberships.

APET includes a powerful fuzzy controller toolset which includes a very flexible editing environment as well as a variety of membership functions to be used.

Each CV feeding into the controller is fuzzified (classified within a fuzzy membership function) by one or more FIS-INPUTS. For control variables (CV) there are typically three types of classification: proximity (this relates to the

normalised value), slope (rate of change) and slope rate of change (this implies acceleration).
For each of the fuzzy families, a specific input must be provided based on the value of the CV (and its recent history).

1. Proximity: this is a comparison of the normalised value of the CV
2. Slope: this represents the slope or rate of change of the CV over a defined period and is calculated within the APC system
3. Slope Rate of Change: this represents the rate of change of the slope of the CV and is calculated within the APC system

4.2.1.1) Fuzzy Sets For CHUTE-J143-G2110-CHUTE.LEVEL

The first transfer chute(J143-G2110-CHUTE) level (J143-LIT-002) reading value is used by the model predictive controller as a (CV).

4.2.1.2) Fuzzy Sets For MOTOR-J143-G2118.CURRENT

The first screen (J143-G2110) motor current (Screen Motor J143-G2118 Current) is used by the model predictive controller as a control variable (CV).

4.2.1.3) Fuzzy Sets For CHUTE-J143-G2120-CHUTE.LEVEL

The second transfer chute(J143-G2120-CHUTE) level (J143-LIT-004) reading value is used by the model predictive controller as a (CV).

4.2.1.4) Fuzzy Sets For MOTOR-J143-G2128.CURRENT

The second screen (J143-G2120) motor current (Screen Motor J143-G2128 Current) is used by the model predictive controller as a control variable (CV).

4.2.1.5) Fuzzy Sets For CNVYR-J154-G2900.CURRENT

The screens (J142-G2110 and J142-G2120) under size (-25mm) conveyor (J154-G2800) motor current (J154-G2868 Current) is used by the model predictive controller as a control variable (CV).

4.2.1.6) Fuzzy Sets For CNVYR-J154-G3000.CURRENT

There are no fuzzy sets for the JIG stockpile feed conveyor (J154-G3000) motor current (Tertiary Crusher Conveyor J154-G3000 Current). This reading is used by the model predictive controller as a control variable (CV).

4.2.1.7) Fuzzy Sets For CNVYR-J154-G3000.TOTAL-PRODUCT-WEIGHTOMETER

4.2.1.8) Fuzzy Sets For BIN8-J140-BIN-01.LEVEL-06

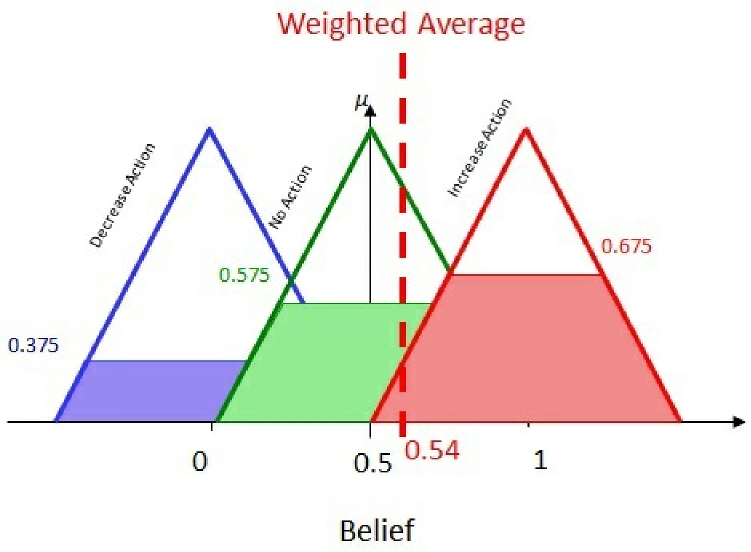
There are no fuzzy memberships for the T-Crushing Feed Bin Compartment 5 level (J140-LIT-006). This reading is used to calculate the available bin inventory.

4.2.1.9) Fuzzy Sets For BIN8-J140-BIN-01.LEVEL-07

There are no fuzzy memberships for the T-Crushing Feed Bin Compartment 6 level (J140-LIT-007). This reading is used to calculate the available bin inventory.

4.2.2) Defuzzy Function

After the inference step, the overall result is a fuzzy value. This result should be defuzzified based on the process state which is In Control to obtain a final crisp output. This is the purpose of the defuzzifier component of a FLS. Defuzzification is performed according to the membership function of the output variable. For instance, assume that we have the result in the figure below at the end of the inference. In this figure, the shaded areas all belong to the fuzzy result. The purpose is to obtain a crisp value, represented by the dotted line in the figure below, from this fuzzy result.



The crisp value (or belief) is then converted back to a setpoint change using the defuzzy function.

4.2.2.1) Defuzzy functions for PID-J143-G1118

The defuzzification of the belief for feeder (J143-G1118) speed PID controller (T-Crusher-1 J141-Rockbox-5 Level PID-Controller J143-G1118) contains functions for Optimizer (for old prime controller, not in use), MPC-Optimizer (Psibyl controller) and Default.

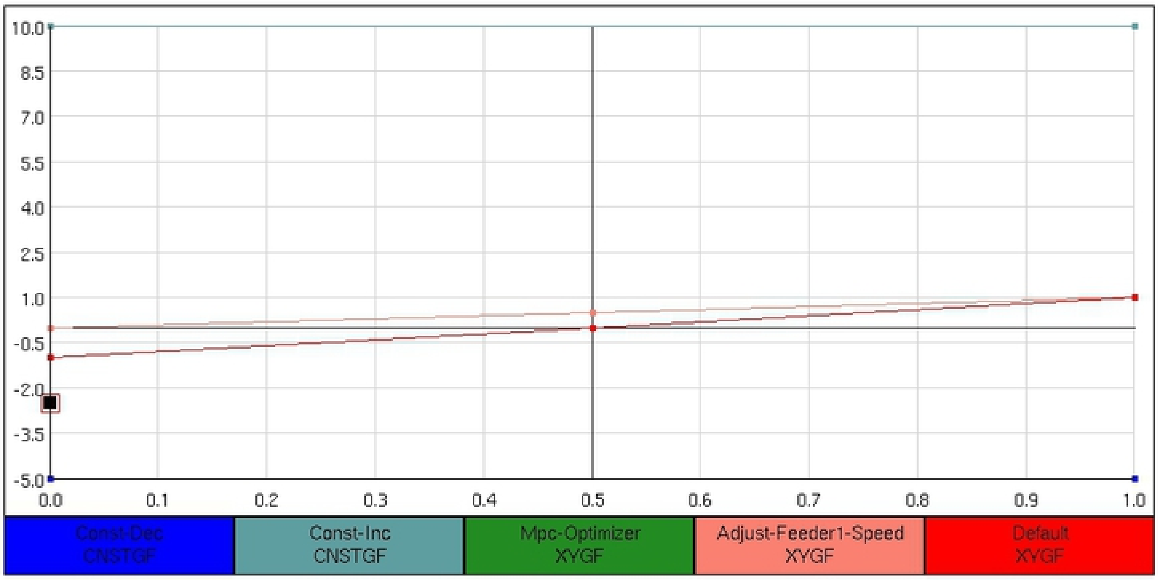


Fig 20: The defuzzy function for PID-J143-G1118.OP-STEP.FIS

4.2.2.2) Defuzzy functions for PID-J143-G2118

The defuzzification of the belief for feeder (J143-G1128) speed PID controller (T-Crusher-1 J141-Rockbox-6 Level PID-Controller J143-G2118) contains functions for Optimizer (for old prime controller, not in use), MPC-Optimizer (Psibyl controller) and Default.

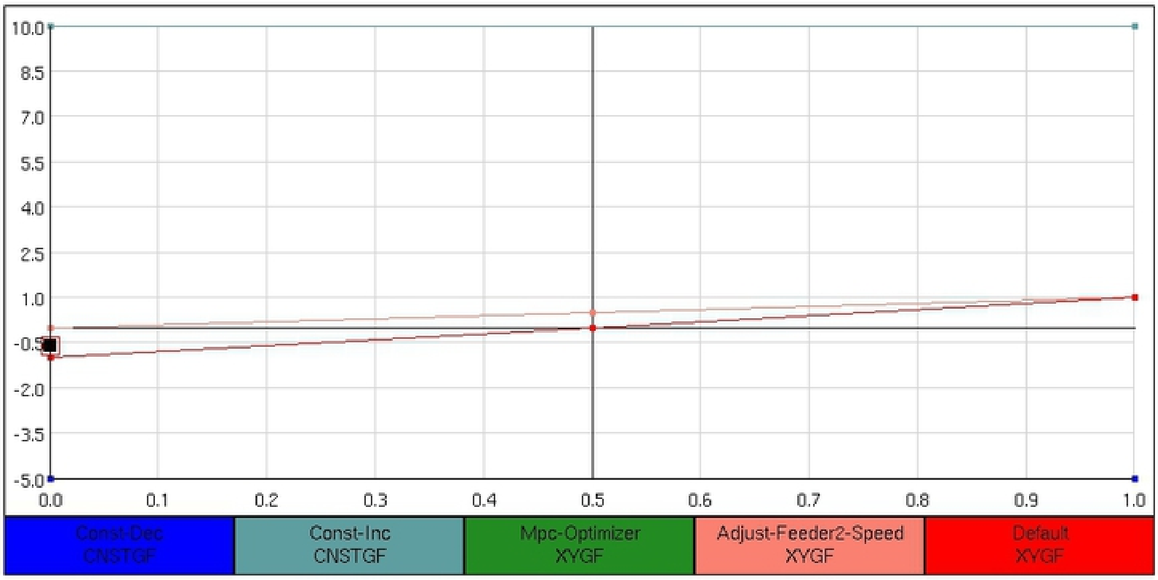


Fig 21: The defuzzy function for PID-J143-G2118.OP-STEP.FIS

4.3) Model Based Control

4.4) Model Predictive Control (MPC)

4.4.1) Model Matrix: PROFIT-CONTROLLER - J143_LIC_002

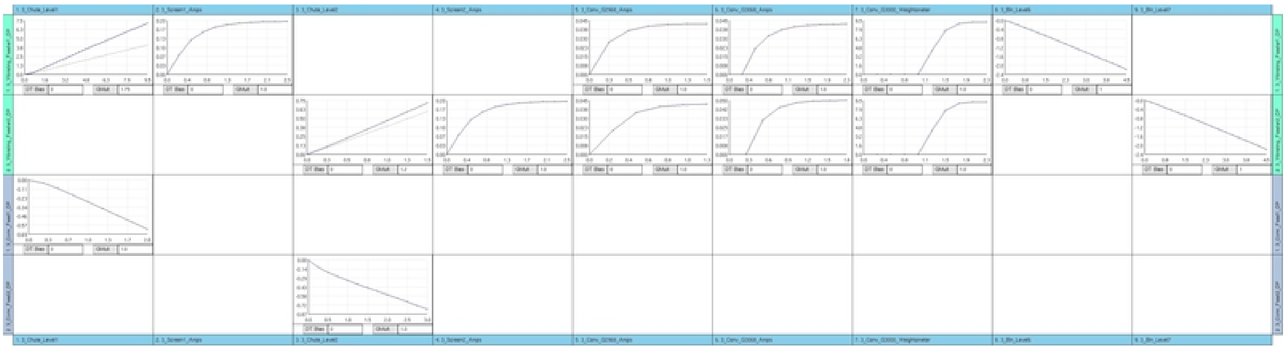
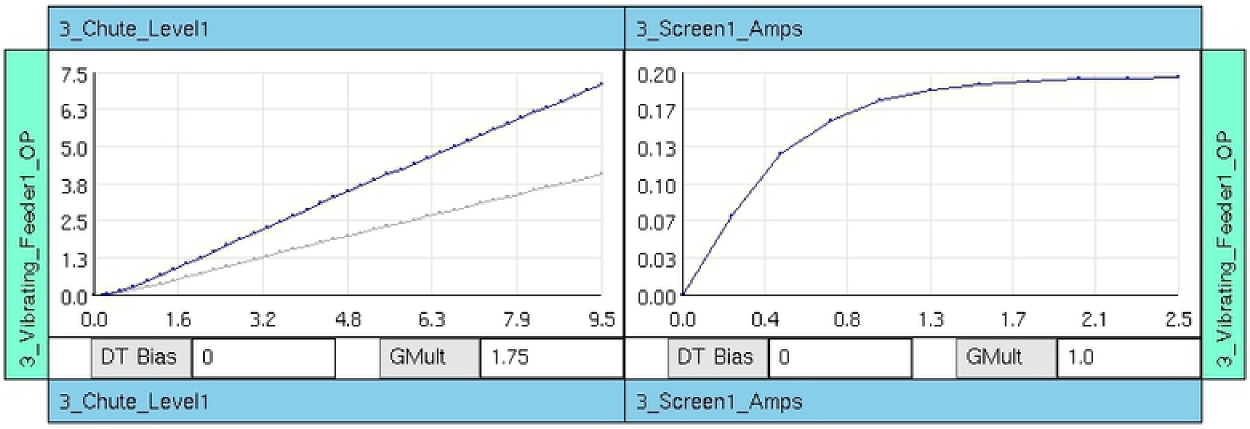
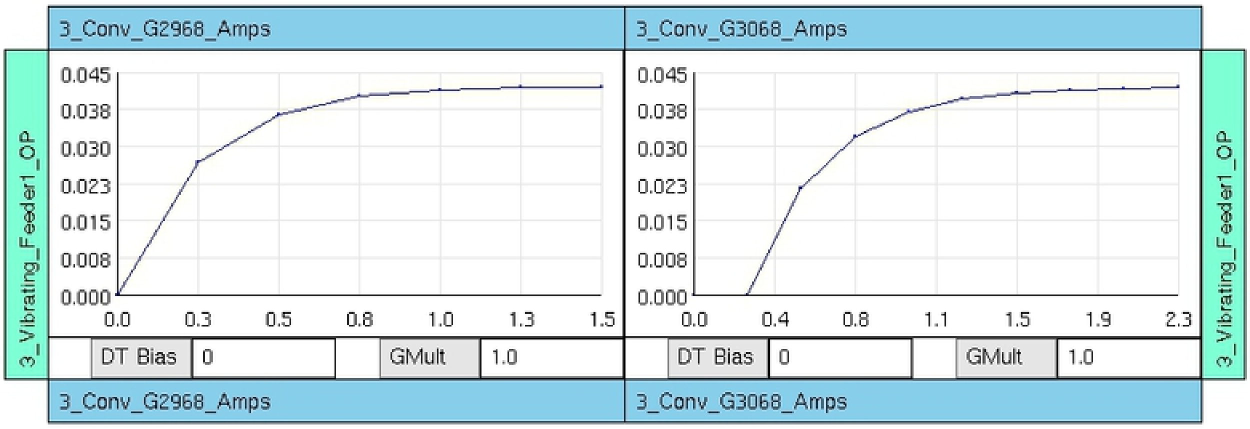
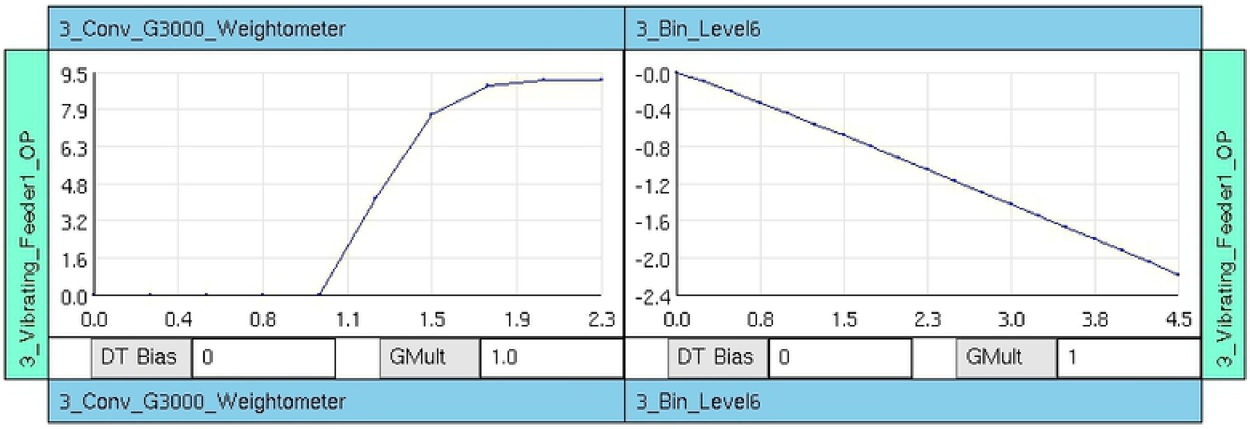
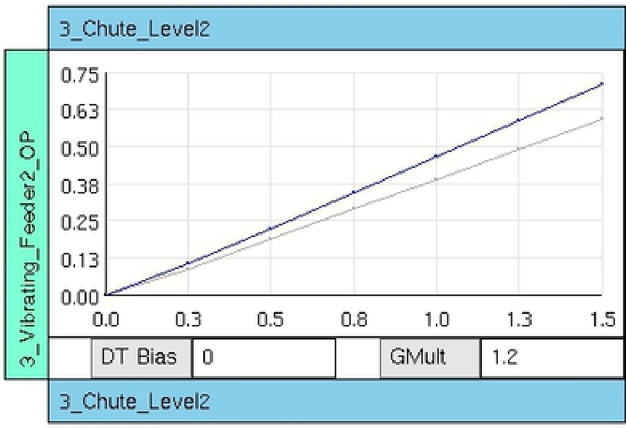


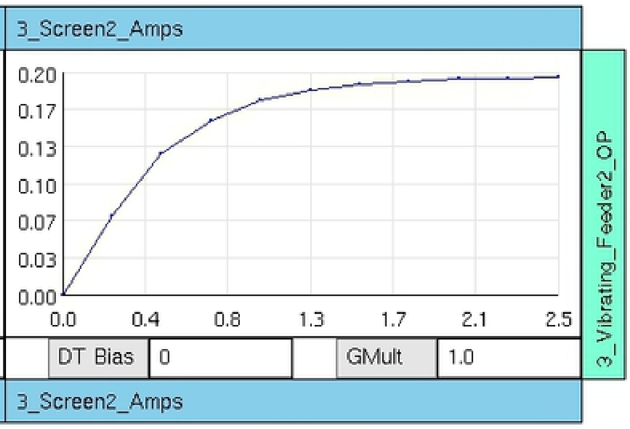
Fig 22: Model Matrix: PROFIT-CONTROLLER - J143_LIC_002

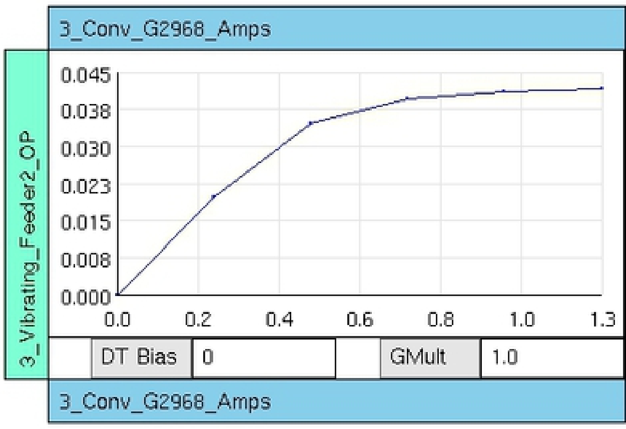


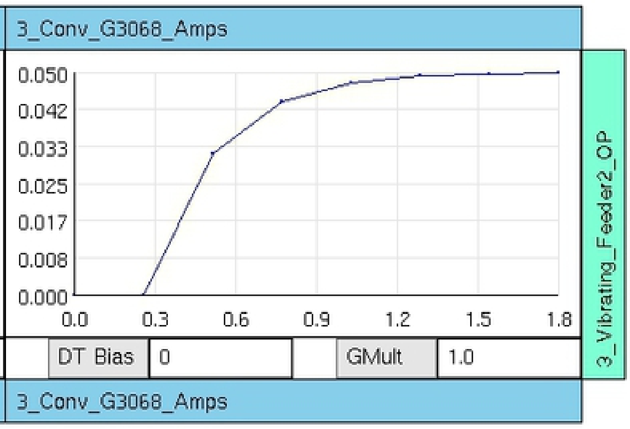


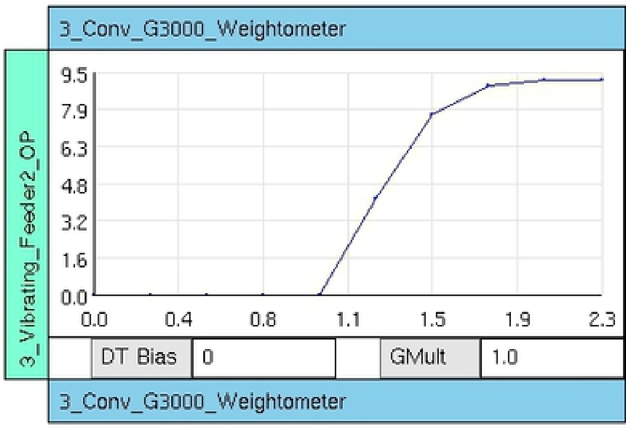


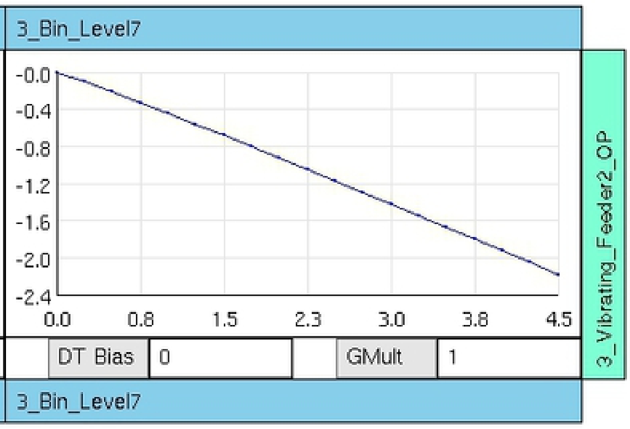

3_Chute_Level2
3_Vibrating_Feeder2_OP
0.75 0.63 0.50 0.38 0.25 0.13 0.00
0.0 0.3 0.5 0.8 1.0 1.3 1.5
DT Bias 0
GMult 1.2
3_Chute_Level2

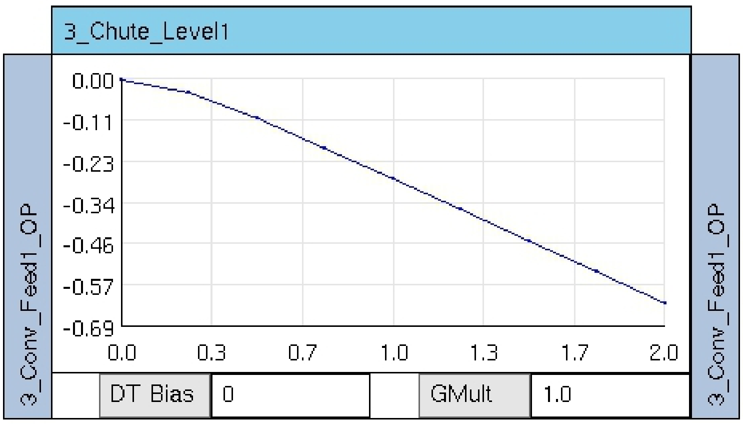

3_Screen2_Amps
3_Vibrating_Feeder2_OP
0.20 0.17 0.13 0.10 0.07 0.03 0.00
0.0 0.4 0.8 1.3 1.7 2.1 2.5
DT Bias 0
GMult 1.0
3_Screen2_Amps

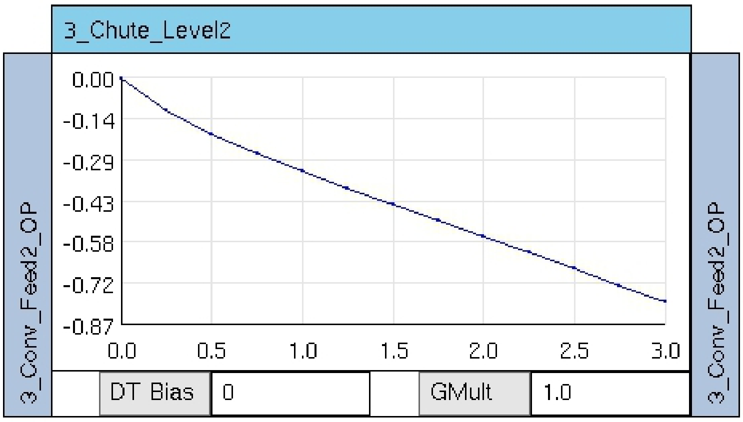

3_Conv_G2968_Amps
3_Vibrating_Feeder2_OP
0.045 0.038 0.030 0.023 0.015 0.008 0.000
0.0 0.2 0.4 0.6 0.8 1.0 1.3
DT Bias 0
GMult 1.0
3_Conv_G2968_Amps


3_Conv_G3068_Amps
3_Vibrating_Feeder2_OP
0.050 0.042 0.033 0.025 0.017 0.008 0.000
0.0 0.3 0.6 0.9 1.2 1.5 1.8
DT Bias 0
GMult 1.0
3_Conv_G3068_Amps


3_Conv_G3000_Weightometer
3_Vibrating_Feeder2_OP
9.5 7.9 6.3 4.8 3.2 1.6 0.0
0.0 0.4 0.8 1.1 1.5 1.9 2.3
DT Bias 0
GMult 1.0
3_Conv_G3000_Weightometer


3_Bin_Level7
3_Vibrating_Feeder2_OP
-0.0 -0.4 -0.8 -1.2 -1.6 -2.0 -2.4
0.0 0.8 1.5 2.3 3.0 3.8 4.5
DT Bias 0
GMult 1
3_Bin_Level7


3_Chute_Level1
3_Conv_Feed1_OP
0.00 -0.11 -0.23 -0.34 -0.46 -0.57 -0.69
0.0 0.3 0.7 1.0 1.3 1.7 2.0
DT Bias 0
GMult 1.0



5) Heartbeats

Heartbeats			
Name	Type	Parameter	Update Interval
SIS-JIG.SEP.APC-J143_LIC_002_004C.HB-IN	TIMED-TOGGLE	TIMEOUT:45	15
SIS-JIG.SEP.APC-J143_LIC_002_004C.HB-OUT	TOGGLE	MIN:0; MAX:1	15

6) Tag Listing

6.1) APC Tags

6.1.1) GSI Interface: IDX_COMMON

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.OBJECTIVE	
SIS-JIG.SEP.APC-J143_LIC_002_004C.OBJECTIVE-BEST-PERF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROCESS-RUN-SIGNAL	

6.1.2) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.AUTO-MANUAL-MODE	JIG_Galaxy.J143LIC002_004C_MVC.QON

6.2) CV1 Tags

6.2.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CHUTE-J143-G2110-CHUTE.LEVEL.HH	G02M100.G02M100.DB905;REAL678
SIS-JIG.SEP.CHUTE-J143-G2110-CHUTE.LEVEL.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.PV1_H
SIS-JIG.SEP.CHUTE-J143-G2110-CHUTE.LEVEL.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.PV1_L
SIS-JIG.SEP.CHUTE-J143-G2110-CHUTE.LEVEL.LL	G02M100.G02M100.DB905;REAL686
SIS-JIG.SEP.CHUTE-J143-G2110-CHUTE.LEVEL.PV	G02M100.G02M100.DB905;REAL18

6.3) CV2 Tags

6.3.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.MOTOR-J143-G2118.CURRENT.HH	G02M100.G02M100.DB905;REAL690
SIS-JIG.SEP.MOTOR-J143-G2118.CURRENT.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.PV2_H
SIS-JIG.SEP.MOTOR-J143-G2118.CURRENT.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.PV2_L
SIS-JIG.SEP.MOTOR-J143-G2118.CURRENT.LL	G02M100.G02M100.DB905;REAL698
SIS-JIG.SEP.MOTOR-J143-G2118.CURRENT.PV	JIG_Galaxy.J143G2118_T1.S_Current

6.4) CV3 Tags

6.4.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CHUTE-J143-G2120-CHUTE.LEVEL.HH	G02M100.G02M100.DB905;REAL702
SIS-JIG.SEP.CHUTE-J143-G2120-CHUTE.LEVEL.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.PV3_H
SIS-JIG.SEP.CHUTE-J143-G2120-CHUTE.LEVEL.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.PV3_L
SIS-JIG.SEP.CHUTE-J143-G2120-CHUTE.LEVEL.LL	G02M100.G02M100.DB905;REAL710
SIS-JIG.SEP.CHUTE-J143-G2120-CHUTE.LEVEL.PV	G02M100.G02M100.DB905;REAL70

6.5) CV4 Tags

6.5.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.MOTOR-J143-G2128.CURRENT.HH	G02M100.G02M100.DB905;REAL714
SIS-JIG.SEP.MOTOR-J143-G2128.CURRENT.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.PV4_H
SIS-JIG.SEP.MOTOR-J143-G2128.CURRENT.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.PV4_L

SIS-JIG.SEP.MOTOR-J143-G2128.CURRENT.LL	G02M100.G02M100.DB905;REAL722
SIS-JIG.SEP.MOTOR-J143-G2128.CURRENT.PV	JIG_Galaxy.J143G2128_T1.S_Current

6.6) CV5 Tags

6.6.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CNVYR-J154-G2900.CURRENT.HH	G02M100.G02M100.DB934;REAL678
SIS-JIG.SEP.CNVYR-J154-G2900.CURRENT.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC2.PV1_H
SIS-JIG.SEP.CNVYR-J154-G2900.CURRENT.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC2.PV1_L
SIS-JIG.SEP.CNVYR-J154-G2900.CURRENT.LL	G02M100.G02M100.DB934;REAL686
SIS-JIG.SEP.CNVYR-J154-G2900.CURRENT.PV	G02M100.G02M100.DB934;REAL18

6.7) CV6 Tags

6.7.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CNVYR-J154-G3000.CURRENT.HH	G02M100.G02M100.DB903;REAL690
SIS-JIG.SEP.CNVYR-J154-G3000.CURRENT.INT-HI	JIG_Galaxy.J141LIC002_004C_MVC2.PV2_H
SIS-JIG.SEP.CNVYR-J154-G3000.CURRENT.INT-LO	JIG_Galaxy.J141LIC002_004C_MVC2.PV2_L
SIS-JIG.SEP.CNVYR-J154-G3000.CURRENT.LL	G02M100.G02M100.DB903;REAL698
SIS-JIG.SEP.CNVYR-J154-G3000.CURRENT.PV	G02M100.G02M100.DB932;REAL44

6.8) CV7 Tags

6.8.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CNVYR-J154-G3000.TOTAL-PRODUCT-WEIGHTOMETER.HH	G02M100.G02M100.DB903;REAL702
SIS-JIG.SEP.CNVYR-J154-G3000.TOTAL-PRODUCT-WEIGHTOMETER.LL	G02M100.G02M100.DB903;REAL610
SIS-JIG.SEP.CNVYR-J154-G3000.TOTAL-PRODUCT-WEIGHTOMETER.PV	G02M100.G02M100.DB932;REAL70

6.9) CV8 Tags

6.9.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-06.INT-HI	JIG_Galaxy.J140BIN001C_MVC2.PV2_H
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-06.INT-LO	JIG_Galaxy.J140BIN001C_MVC2.PV2_L
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-06.PV	JIG_Galaxy.J140LIT006_T4.S_ProcessValue

6.10) CV9 Tags

6.10.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-07.INT-HI	JIG_Galaxy.J140BIN001C_MVC2.PV3_H
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-07.INT-LO	JIG_Galaxy.J140BIN001C_MVC2.PV3_L
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-07.PV	JIG_Galaxy.J140LIT007_T4.S_ProcessValue

6.11) MV1 Tags

6.11.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag

SIS-JIG.SEP.FDR-J143-G1118.SPEED.HH	G02M100.G02M100.DB905;REAL726
SIS-JIG.SEP.FDR-J143-G1118.SPEED.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.C1_SP_H
SIS-JIG.SEP.FDR-J143-G1118.SPEED.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.C1_SP_L
SIS-JIG.SEP.FDR-J143-G1118.SPEED.LL	G02M100.G02M100.DB905;REAL734
SIS-JIG.SEP.FDR-J143-G1118.SPEED.PV	G02M100.G02M100.DB905;REAL128
SIS-JIG.SEP.PID-J143-G1118.AUTO-MANUAL-MODE	JIG_Galaxy.J143G1118_T22.C_ManualOn_Off

6.12) MV2 Tags

6.12.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.FDR-J143-G1128.SPEED.HH	G02M100.G02M100.DB905;REAL746
SIS-JIG.SEP.FDR-J143-G1128.SPEED.INT-HI	JIG_Galaxy.J143LIC002_004C_MVC.C2_SP_H
SIS-JIG.SEP.FDR-J143-G1128.SPEED.INT-LO	JIG_Galaxy.J143LIC002_004C_MVC.C2_SP_L
SIS-JIG.SEP.FDR-J143-G1128.SPEED.LL	G02M100.G02M100.DB905;REAL754
SIS-JIG.SEP.FDR-J143-G1128.SPEED.PV	G02M100.G02M100.DB905;REAL178
SIS-JIG.SEP.PID-J143-G2118.AUTO-MANUAL-MODE	JIG_Galaxy.J143G2118_T22.C_ManualOn_Off

6.13) DV1 Tags

6.13.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CNVYR-J143-G3400.HZ-SPEED.PV	JIG_Galaxy.J143G3468_T12.S_Speed

6.14) DV2 Tags

6.14.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.CNVYR-J143-G3500.HZ-SPEED.PV	JIG_Galaxy.J143G3568_T12.S_Speed

6.15) PROCESS-STATES Tags

6.15.1) GSI Interface: IDX_COMMON

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2110-LEVEL-HIGH.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2110-LEVEL-HIGH.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2110-LEVEL-LOW.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2110-LEVEL-LOW.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2120-LEVEL-HIGH.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2120-LEVEL-HIGH.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2120-LEVEL-LOW.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CHUTE-J143-G2120-LEVEL-LOW.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CONVEYOR-154-G2900-CONSTRAINED.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CONVEYOR-154-G2900-CONSTRAINED.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CONVEYOR-154-G3000-CONSTRAINED.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.CONVEYOR-154-G3000-CONSTRAINED.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ROOT.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ROOT.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.MPC-OPTIMIZER.STATE-BELIEF	

SIS-JIG.SEP.APC-J143_LIC_002_004C.MPC-OPTIMIZER.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.SCREEN-J143-G2110-CONSTRAINED.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.SCREEN-J143-G2110-CONSTRAINED.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.SCREEN-J143-G2120-CONSTRAINED.STATE-BELIEF	
SIS-JIG.SEP.APC-J143_LIC_002_004C.SCREEN-J143-G2120-CONSTRAINED.STATE-INDEX	
SIS-JIG.SEP.APC-J143_LIC_002_004C.STATE-INDEX	

6.15.2) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.CRIT-ALARMS.CMNTS	JIG_Galaxy.J143LIC002_004C_MVC.S1_CMNT
SIS-JIG.SEP.APC-J143_LIC_002_004C.CRIT-ALARMS.DESC	JIG_Galaxy.J143LIC002_004C_MVC.S1_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.CRIT-ALARMS.STATE-BELIEF	JIG_Galaxy.J143LIC002_004C_MVC.S1_WEIGHT
SIS-JIG.SEP.APC-J143_LIC_002_004C.CRIT-ALARMS.STATE-INDEX	JIG_Galaxy.J143LIC002_004C_MVC.S1_STATE
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ALARMS.CMNTS	JIG_Galaxy.J143LIC002_004C_MVC.S4_CMNT
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ALARMS.DESC	JIG_Galaxy.J143LIC002_004C_MVC.S4_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ALARMS.STATE-BELIEF	JIG_Galaxy.J143LIC002_004C_MVC.S4_WEIGHT
SIS-JIG.SEP.APC-J143_LIC_002_004C.DEF-ALARMS.STATE-INDEX	JIG_Galaxy.J143LIC002_004C_MVC.S4_STATE
SIS-JIG.SEP.APC-J143_LIC_002_004C.HIGH-ALARMS.CMNTS	JIG_Galaxy.J143LIC002_004C_MVC.S2_CMNT
SIS-JIG.SEP.APC-J143_LIC_002_004C.HIGH-ALARMS.DESC	JIG_Galaxy.J143LIC002_004C_MVC.S2_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.HIGH-ALARMS.STATE-BELIEF	JIG_Galaxy.J143LIC002_004C_MVC.S2_WEIGHT
SIS-JIG.SEP.APC-J143_LIC_002_004C.HIGH-ALARMS.STATE-INDEX	JIG_Galaxy.J143LIC002_004C_MVC.S2_STATE
SIS-JIG.SEP.APC-J143_LIC_002_004C.LOW-ALARMS.CMNTS	JIG_Galaxy.J143LIC002_004C_MVC.S3_CMNT
SIS-JIG.SEP.APC-J143_LIC_002_004C.LOW-ALARMS.DESC	JIG_Galaxy.J143LIC002_004C_MVC.S3_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.LOW-ALARMS.STATE-BELIEF	JIG_Galaxy.J143LIC002_004C_MVC.S3_WEIGHT
SIS-JIG.SEP.APC-J143_LIC_002_004C.LOW-ALARMS.STATE-INDEX	JIG_Galaxy.J143LIC002_004C_MVC.S3_STATE

6.16) MESSAGES Tags

6.16.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.BODY1	JIG_Galaxy.J143LIC002_004C_MVC.M1_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.BODY2	JIG_Galaxy.J143LIC002_004C_MVC.M2_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.BODY3	JIG_Galaxy.J143LIC002_004C_MVC.M3_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.BODY4	JIG_Galaxy.J143LIC002_004C_MVC.M4_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.BODY5	JIG_Galaxy.J143LIC002_004C_MVC.M5_DESCR
SIS-JIG.SEP.APC-J143_LIC_002_004C.ID1	JIG_Galaxy.J143LIC002_004C_MVC.M1_LOGIC
SIS-JIG.SEP.APC-J143_LIC_002_004C.ID2	JIG_Galaxy.J143LIC002_004C_MVC.M2_LOGIC
SIS-JIG.SEP.APC-J143_LIC_002_004C.ID3	JIG_Galaxy.J143LIC002_004C_MVC.M3_LOGIC
SIS-JIG.SEP.APC-J143_LIC_002_004C.ID4	JIG_Galaxy.J143LIC002_004C_MVC.M4_LOGIC
SIS-JIG.SEP.APC-J143_LIC_002_004C.ID5	JIG_Galaxy.J143LIC002_004C_MVC.M5_LOGIC
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-ACTION1	JIG_Galaxy.J143LIC002_004C_MVC.M1_ACTION
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-ACTION2	JIG_Galaxy.J143LIC002_004C_MVC.M2_ACTION
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-ACTION3	JIG_Galaxy.J143LIC002_004C_MVC.M3_ACTION
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-ACTION4	JIG_Galaxy.J143LIC002_004C_MVC.M4_ACTION
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-ACTION5	JIG_Galaxy.J143LIC002_004C_MVC.M5_ACTION
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-CHANGE1	JIG_Galaxy.J143LIC002_004C_MVC.M1_CHANGE
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-CHANGE2	JIG_Galaxy.J143LIC002_004C_MVC.M2_CHANGE
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-CHANGE3	JIG_Galaxy.J143LIC002_004C_MVC.M3_CHANGE
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-CHANGE4	JIG_Galaxy.J143LIC002_004C_MVC.M4_CHANGE
SIS-JIG.SEP.APC-J143_LIC_002_004C.SP-CHANGE5	JIG_Galaxy.J143LIC002_004C_MVC.M5_CHANGE
SIS-JIG.SEP.APC-J143_LIC_002_004C.TIME1	JIG_Galaxy.J143LIC002_004C_MVC.M1_TIMESTAMP
SIS-JIG.SEP.APC-J143_LIC_002_004C.TIME2	JIG_Galaxy.J143LIC002_004C_MVC.M2_TIMESTAMP
SIS-JIG.SEP.APC-J143_LIC_002_004C.TIME3	JIG_Galaxy.J143LIC002_004C_MVC.M3_TIMESTAMP
SIS-JIG.SEP.APC-J143_LIC_002_004C.TIME4	JIG_Galaxy.J143LIC002_004C_MVC.M4_TIMESTAMP

SIS-JIG.SEP.APC-J143_LIC_002_004C.TIME5	JIG_Galaxy.J143LIC002_004C_MVC.M5_TIMESTAMP

6.17) INTERLOCKS Tags

6.17.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_1	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_IL_WordA.08
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_1-DESC	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_FaultTable[1]
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_2	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_IL_WordA.09
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_2-DESC	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_FaultTable[2]
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_3	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_IL_WordA.10
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_3-DESC	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_FaultTable[3]
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_4	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_IL_WordA.11
SIS-JIG.SEP.APC-J143_LIC_002_004C.INTERLOCKS.ILCK_4-DESC	JIG_Galaxy.J143LIC002_004C_MVC_FU.STA_FaultTable[4]

6.18) PROFIT-CONTROLLER Tags

6.18.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT.CONTROL-RESTART	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Control Restart.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT.DEMAND	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/urtDemand.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT.HB	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/urtIntervalCount.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT.URT-COUNTDOWN	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/urtCountdown.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT.URT-EXEC-STATE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/urtExecState.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_CTRL-MODE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Controller Mode.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_DISPLAY-STATUS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Displayed Status.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_MPC-STATE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MPC_State.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_ON-OFF-TOGGLE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Turn ON OFF.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_OPT-ACC-TOL	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Opt Acceleration Tol.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_OPT-SPEED-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Optimizer Speed Factor.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_READ-MODEL-FLAG	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Read Model Flag.InternalValue

6.19) PROFIT-CONTROLLER-CV1 Tags

6.19.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.BALANCE-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Balar Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Close Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.DV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[1]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.DV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[1]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Contr This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/FF to Perf Ratio.Value
SIS-JIG.SEP.APC-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Futur

J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.FUTURE-VALUE	Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Delta Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/High Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Mode type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Read Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Linea Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Delta Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Low I Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.MV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[0]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.MV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[0]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Numb of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Read Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/State Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Desir Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL1.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level1/Quac Coeff.Value

6.20) PROFIT-CONTROLLER-CV2 Tags

6.20.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.BALANCE-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Bal Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Clo Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Cor This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/FF Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.FUTURE-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Fut Value.Value

VALUE	
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Del Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Hig Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Hig Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Mo type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Rea Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Lin Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Del Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Lov Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Lov Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.MV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[2]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.MV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[2]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Nu of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Pe Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Rea Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Sta Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/De Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN1_AMPS.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen1_Amps/Qu Coeff.Value

6.21) PROFIT-CONTROLLER-CV3 Tags

6.21.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.BALANCE-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Bala Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Close Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.DV2.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[4]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.DV2.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[4]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Contr This CV.InternalValue
SIS-JIG.SEP.APC-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/FF to

J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.FF-TO-FB-PERF-RATIO	Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.FUTURE-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Futur Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Delta Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/High Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Mode type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Read Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Linea Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Delta Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Low I Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.MV2.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[3]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.MV2.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[3]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Numb of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Read Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/State Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Desir Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CHUTE_LEVEL2.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Chute_Level2/Quac Coeff.Value

6.22) PROFIT-CONTROLLER-CV4 Tags

6.22.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.BALANCE-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Bal Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Clo Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Cor This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.FF-TO-FB-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/FF Perf Ratio.Value

PERF-RATIO	
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.FUTURE-VALUE	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Fut Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.HIGH-LIMIT-DELTA	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Del Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.HIGH-LIMIT-SLOT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Hig Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.HIGH-LIMIT-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Hig Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.INTEGRATING	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Mo type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.LIMIT-VIOLATION	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Rea Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.LINEAR-COEFF	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Lin Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.LOW-LIMIT-DELTA	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Del Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.LOW-LIMIT-SLOT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Lov Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.LOW-LIMIT-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Lov Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.MV2.DTBIAS	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[5]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.MV2.GMULT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[5]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.NUMBER-OF-BLOCKS	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Nu of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.PERF-RATIO	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Pe Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.PV	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Rea Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.SS-VALUE	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.STATE-ESTIMATION	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Sta Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.TARGET	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Des Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_SCREEN2_AMPS.TARGET-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Screen2_Amps/Qu Coeff.Value

6.23) PROFIT-CONTROLLER-CV5 Tags

6.23.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.BALANCE-FACTOR	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.ENABLED	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.FF-TO-FB-PERF-RATIO	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Perf Ratio.Value

SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.FUTURE-VALUE	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.HIGH-LIMIT-DELTA	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.HIGH-LIMIT-SLOT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.HIGH-LIMIT-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.INTEGRATING	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.LIMIT-VIOLATION	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.LINEAR-COEFF	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.LOW-LIMIT-DELTA	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.LOW-LIMIT-SLOT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.LOW-LIMIT-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.MV1.DTBIAS	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Valu
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.MV1.GMULT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.MV2.DTBIAS	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Valu
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.MV2.GMULT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.NUMBER-OF-BLOCKS	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.PERF-RATIO	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.PV	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.SS-VALUE	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.STATE-ESTIMATION	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.TARGET	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G2968_AMPS.TARGET-WEIGHT	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G2968_/ Coeff.Value

6.24) PROFIT-CONTROLLER-CV6 Tags

6.24.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.BALANCE-FACTOR	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.ENABLED	(J143_LIC_002)\$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ This CV.InternalValue

SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.FUTURE-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.MV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Valu
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.MV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.MV2.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Valu
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.MV2.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3068_AMPS.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Conv_G3068_/ Coeff.Value

6.25) PROFIT-CONTROLLER-CV7 Tags

6.25.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.BALANCE-FACTOR	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.CLOSED-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co

LOOP-RESP-TIME	Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.FUTURE-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.MV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Tin
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.MV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Mul
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.MV2.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Tin
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.MV2.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Mul
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_G3000_WEIGHTOMETER.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Co Coeff.Value

6.26) PROFIT-CONTROLLER-CV8 Tags

6.26.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Balance

J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.BALANCE-FACTOR	Factor Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Closed Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Control This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/FF to FB Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.FUTURE-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Future Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Delta Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/High Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Model type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Read Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Linear Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Delta Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Low Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.MV1.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[12]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.MV1.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[12]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Number of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Read Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/State Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Desired Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL6.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level6/Quadratic Coeff.Value

6.27) PROFIT-CONTROLLER-CV9 Tags

6.27.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.BALANCE-	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Balance Factor Value.Value

FACTOR	
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.CLOSED-LOOP-RESP-TIME	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Closed Loop Resp Time.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Control This CV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.FF-TO-FB-PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/FF to FB Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.FUTURE-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Future Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.HIGH-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Delta Soft High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.HIGH-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/High Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.HIGH-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/High Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.INTEGRATING	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Model type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Read Value.Color
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Linear Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.LOW-LIMIT-DELTA	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Delta Soft Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.LOW-LIMIT-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Low Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.LOW-LIMIT-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Low Limit Error Weight.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.MV2.DTBIAS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Dead Time Bias.Value[13]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.MV2.GMULT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/Gain Multiplier.Value[13]
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Number of Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.PERF-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Perf Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Read Value DCS.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.SS-VALUE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/SS Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.STATE-ESTIMATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/State Estimation.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Desired Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_BIN_LEVEL7.TARGET-WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/CV/3_Bin_Level7/Quadratic Coeff.Value

6.28) PROFIT-CONTROLLER-MV1 Tags

6.28.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.APC-SP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating

SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.CONSTRAINT-TYPE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.DELTA-SOFT-HIGH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.DELTA-SOFT-LOW-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating MV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.HIGH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.LOW-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.MAIN-CV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating CV.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.MAX-MOVE-DOWN	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Down.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.MAX-MOVE-UP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.MV-MAN-ACTION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Action.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP-HIGH	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Windup.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP-HIGH-TRANSITION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Transition.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP-LOW	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Windup.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP-LOW-TRANSITION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Transition.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.OP-TO-PV-GAIN	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Gain.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.PB-ANTIWINDUP-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.QUADRATIC-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.RESOLUTION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.SP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.STATUS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.USE-ARCH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.InternalValue

SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER1_OP.WINDUP-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Status.InternalValue

6.29) PROFIT-CONTROLLER-MV2 Tags

6.29.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.APC-SP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.CONSTRAINT-TYPE	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Type.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.DELTA-SOFT-HIGH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.DELTA-SOFT-LOW-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating MV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.HIGH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.LIMIT-VIOLATION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.LINEAR-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.LOW-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.MAIN-CV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating CV.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.MAX-MOVE-DOWN	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Down.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.MAX-MOVE-UP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.MV-MAN-ACTION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Action.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.NUMBER-OF-BLOCKS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Blocks.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP-HIGH	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Windup.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP-HIGH-TRANSITION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Transition.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP-LOW	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Windup.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP-LOW-TRANSITION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Transition.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.OP-TO-PV-GAIN	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Gain.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.PB-ANTIWINDUP-RATIO	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Ratio.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value

SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.QUADRATIC-COEFF	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Coeff.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.RESOLUTION	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.SP	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.STATUS	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.TARGET	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Value.Value
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.USE-ARCH-LIMIT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Limit.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.WEIGHT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_VIBRATING_FEEDER2_OP.WINDUP-SLOT	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/MV/3_Vibrating Status.InternalValue

6.30) PROFIT-CONTROLLER-DV1 Tags

6.30.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_FEED1_OP.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/DV/3_Conv_Feed1_OP/Use This DV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_FEED1_OP.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/DV/3_Conv_Feed1_OP/Reac Value.Value

6.31) PROFIT-CONTROLLER-DV2 Tags

6.31.1) GSI Interface: IDX_SIS_MPC_26583_JIG_T_CRUSHING_HONEYWELL

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_FEED2_OP.ENABLED	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/DV/3_Conv_Feed2_OP/Use This DV.InternalValue
SIS-JIG.SEP.APC-J143_LIC_002_004C.PROFIT_3_CONV_FEED2_OP.PV	(J143_LIC_002)/$J143_LIC_002/J143_LIC_002/ProfCon/DV/3_Conv_Feed2_OP/Reac Value.Value

6.32) OTHER Tags

6.32.1) GSI Interface: IDX_SIS_EXPERT_22583_JIG_T_CRUSHING

Tag	OPC Tag
SIS-JIG.SEP.APC-J143_LIC_002_004C.HB-IN	G02M100.G02M100.DB905;INT664
SIS-JIG.SEP.APC-J143_LIC_002_004C.HB-OUT	G02M100.G02M100.DB905;INT14
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-01.HH	G02M100.G02M100.DB940;REAL436
SIS-JIG.SEP.BIN8-J140-BIN-01.LEVEL-01.LL	G02M100.G02M100.DB940;REAL444
SIS-JIG.SEP.CNVYR-J143-G3400.STATUS.PV	JIG_Galaxy.J143G3468_T12.S_Running
SIS-JIG.SEP.CNVYR-J143-G3500.STATUS.PV	JIG_Galaxy.J143G3568_T12.S_Running
SIS-JIG.SEP.CNVYR-J154-G2900.STATUS.PV	JIG_Galaxy.J154G2968_T1.S_Running
SIS-JIG.SEP.CNVYR-J154-G3000.STATUS.PV	JIG_Galaxy.J154G3068_T25.S_Running
SIS-JIG.SEP.FDR-J143-G1118.STATUS.PV	JIG_Galaxy.J143G1118_T12.S_Running
SIS-JIG.SEP.FDR-J143-G1128.STATUS.PV	JIG_Galaxy.J143G1128_T12.S_Running
SIS-JIG.SEP.MOTOR-J143-G2118.STATUS.PV	JIG_Galaxy.J143G2118_T1.S_Running
SIS-JIG.SEP.MOTOR-J143-G2128.STATUS.PV	JIG_Galaxy.J143G2128_T1.S_Running

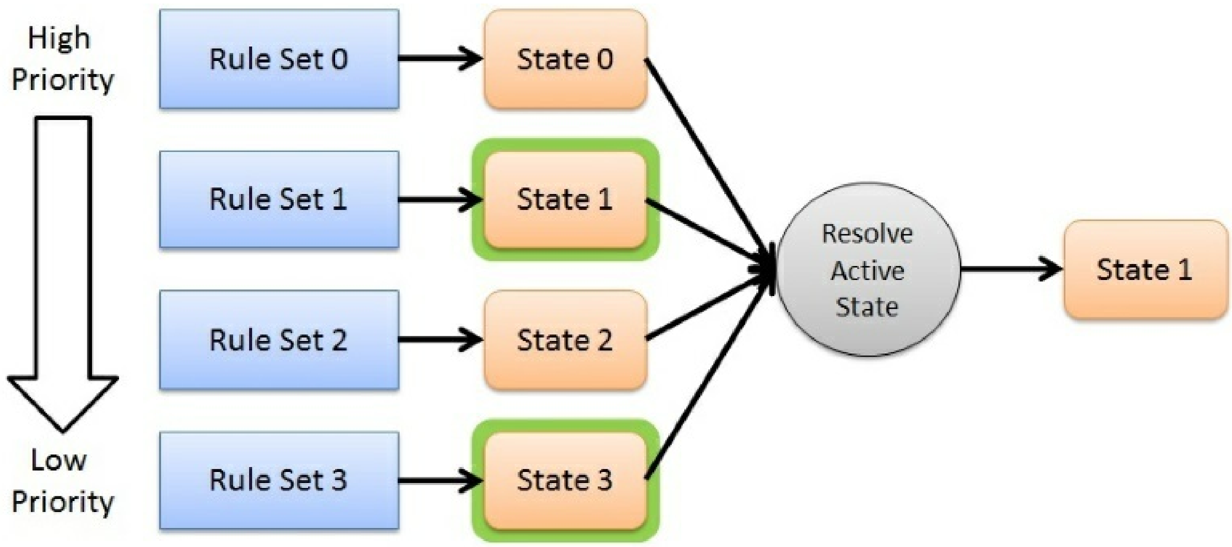
ADDENDUMS

A1 - Basic Principles of Process States

In APET, control philosophies are built around the state of the process. Different process conditions (broadly speaking) require different actions to be taken to achieve performance targets. In APET, process states are resolved through graphical rules and used in a hierarchical bidding system to determine the current process state. The governing state is then used in deciding which control scheme to implement.

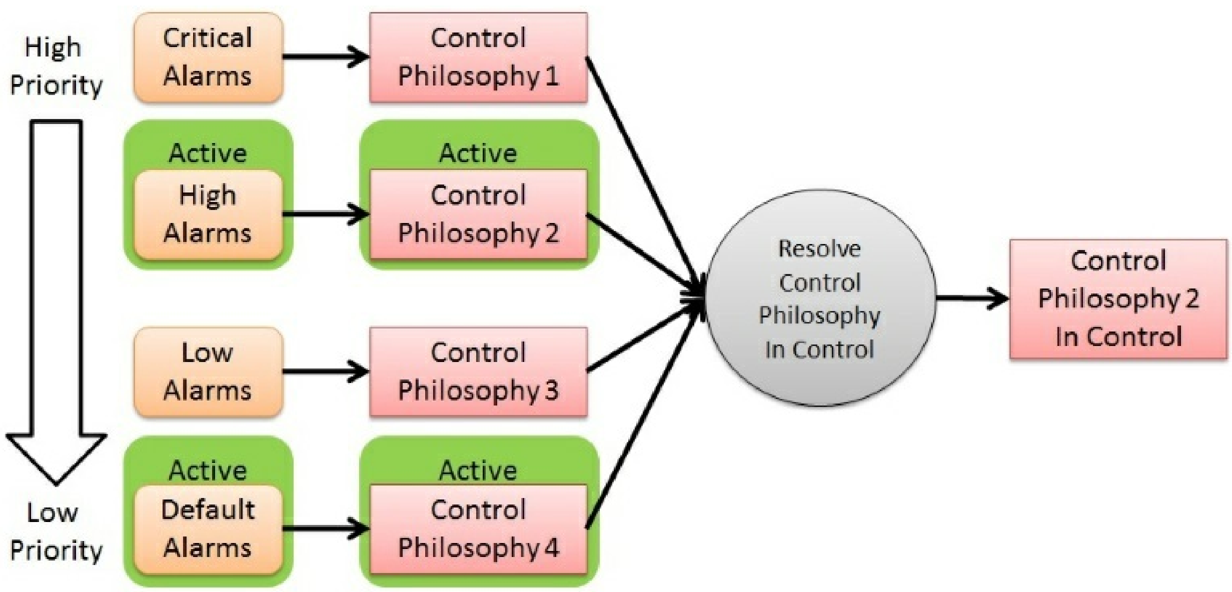
These two steps are briefly described below.

1) Active State Resolution
Each state is determined by a set of rules. These are usually built up using graphical rules and may monitor any information available within the APET application. A state is considered active if all specified conditions are met. This means that it is possible the more than one state can be active at a time. To deal with this, states are ranked based on a priority, so that the active state with the highest priority becomes the in-control state.



Because it is also possible that no states are active, it is important to select a state that acts as the default state. The default state usually corresponds to the state with the lowest priority (default alarms).

2) Control Philosophy Resolution
Each state corresponds to a specific control philosophy that will be implemented. Once the active state has been determined, the corresponding control philosophy is activated.



There are always 4 controller states for every APC controller in APET. These controller states are grouped together as follows:
1. Critical Alarms
2. High Alarms
3. Low Alarms
4. Default Alarms

Each of these 4 controller states may containing at least one referencing state. For example, the Default Alarms container will contain the MPC optimizer and default states amongst others.

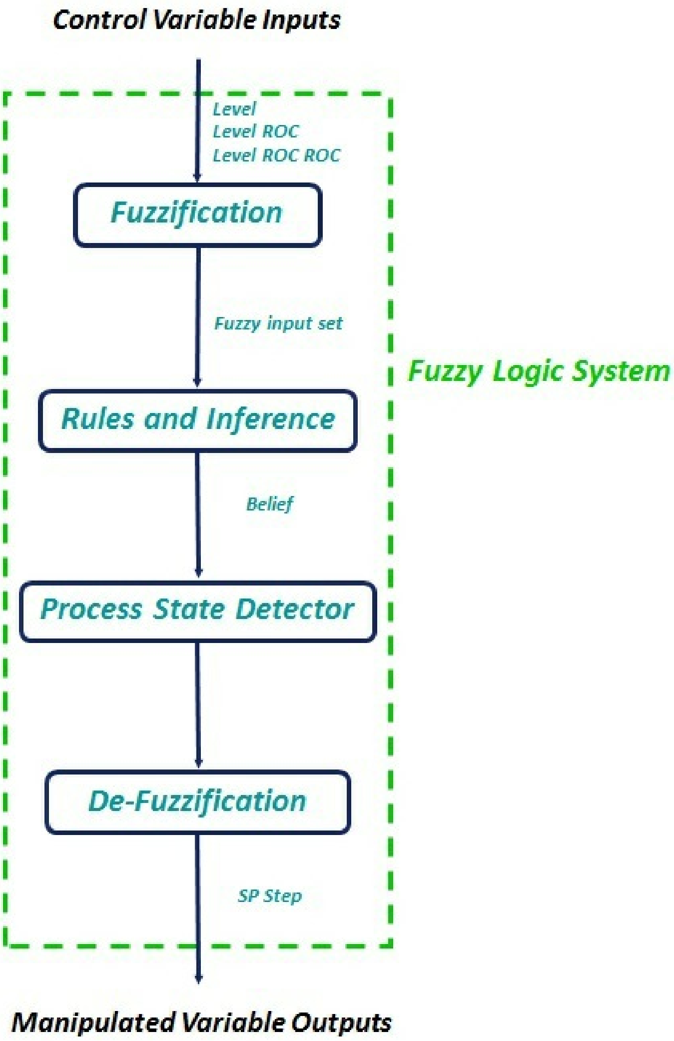
Based on the referenced states of each controller state, the State Index of the controller state may be:
0 if it is not active
1 active but not in-control
2 active AND in-control

All of the attributes of the controller states are display on the SCADA faceplate.

If the controller has detected a certain process state scenario, it will take corrective actions in an attempt to resolve this scenario. The corresponding BELIEF value displayed next to a PROCESS STATE is an indication of how true this state is. The belief value of each state will determine the size of the control actions implemented. If the PROCESS STATE belief state is 65.0% true, than less aggressive control actions will be implemented to resolve this condition compared to a scenario where the belief value is 90.0% true. This approach implies that the controller will never wait for any process state (excluding the DEFAULT state, which represents the stable state) to reach a value of 100.0% before implementing any control actions to resolve the state. All of the PROCESS STATES other than the DEFAULT state are less desirable state conditions and the controller will attempt to keep their belief values as low as possible.

A2 - Basic principles of Fuzzy Control

A fuzzy logic system (FLS) can be defined as the nonlinear mapping of an input data set to a scalar output data. A FLS consists of four main parts: fuzzifier, rules, inference engine, and defuzzifier. These components and the general architecture of a FLS is shown in the figure below.



The process of fuzzy logic is defined as follows: Firstly, a crisp set of input data are gathered and converted to a fuzzy set using fuzzy linguistic variables, fuzzy linguistic terms and membership functions. This step is known as fuzzification. Afterwards, an inference is made based on a set of rules. Lastly, the resulting fuzzy output is mapped to a crisp output using the membership functions, in the defuzzification step.

The fuzzy logic algorithm can be summarized as follows:

1. Define the linguistic variables and terms (initialization)
2. Construct the membership functions (initialization)
3. Construct the rule base (initialization)
4. Convert crisp input data to fuzzy values using the membership functions (fuzzification)
5. Evaluate the rules in the rule base (inference)
6. Combine the results of each rule (inference)
7. Convert the output data to non-fuzzy values (defuzzification)

Linguistic variables are the input or output variables of the system whose values are words or sentences from a natural language, instead of numerical values. A linguistic variable is generally decomposed into a set of linguistic terms. Example: Leven in a bin. Let level (LVL) be the linguistic variable which represents the amount of material in the bin. To qualify the level, terms such as high and low are used in real life. These are the linguistic values of the level. Then, LVL(t) = extremely low, low, ok, high, extremely high can be the set of decompositions for the linguistic variable level. Each member of this decomposition is called a linguistic term and can cover a portion of the overall values of the bin level.

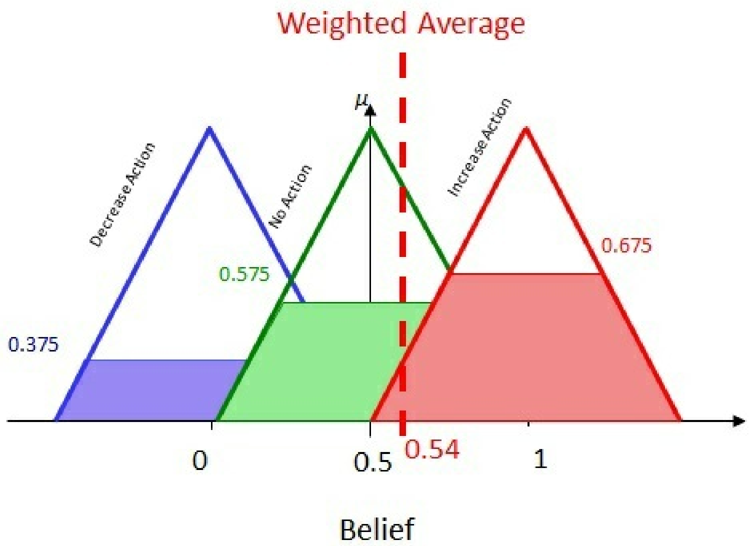
Membership functions are used in the fuzzification and defuzzification steps of a FLS, to map the non-fuzzy input values to fuzzy linguistic terms and vice versa. A membership function is used to quantify a linguistic term. Note that, an important characteristic of fuzzy logic is that a numerical value does not have to be fuzzified using only one membership function. In other words, a value typically belongs to multiple sets at the same time. For example the bin level value can be considered as extremely low and low at the same time, with different degrees of memberships.

APET includes a powerful fuzzy controller toolset which includes a very flexible editing environment as well as a variety of membership functions to be used.

Each CV feeding into the controller is fuzzified (classified within a fuzzy membership function) by one or more FIS-INPUTS. For control variables (CV) there are typically three types of classification: proximity (this relates to the normalized value), slope (rate of change) and slope rate of change (this implies acceleration).

For each of the fuzzy families, a specific input must be provided based on the value of the CV (and its recent history).
1. Proximity: this is a comparison of the normalized value of the CV
2. Slope: this represents the slope or rate of change of the CV over a defined period and is calculated within the APC system
3. Slope Rate of Change: this represents the rate of change of the slope of the CV and is calculated within the APC system

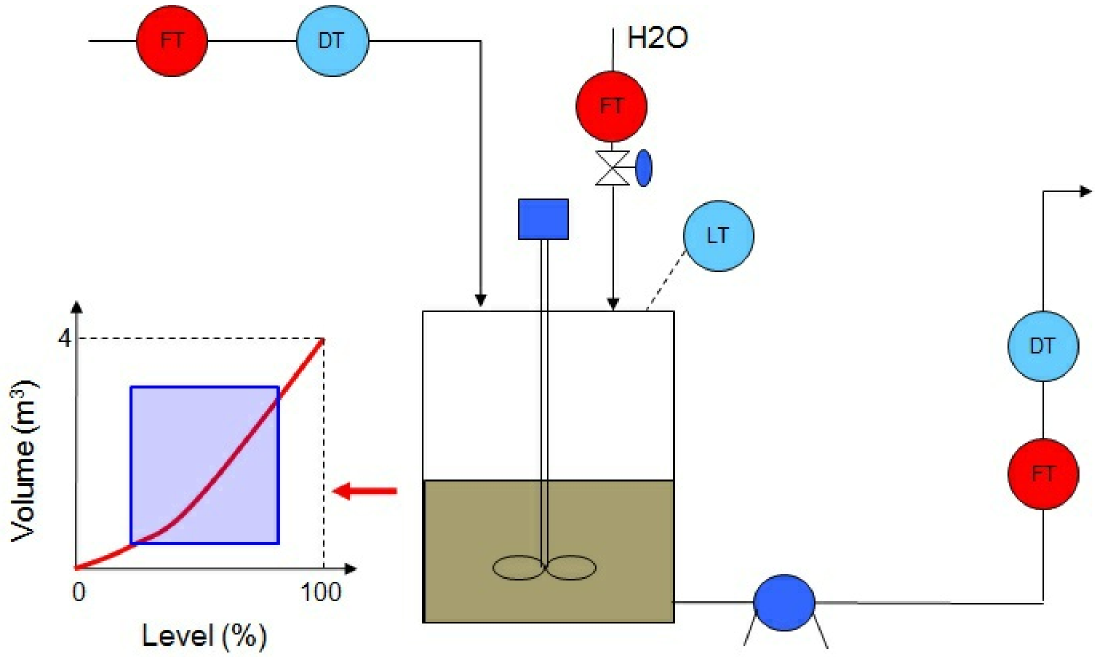
After the inference step, the overall result is a fuzzy value. This result should be defuzzified based on the process state which is In Control to obtain a final crisp output. This is the purpose of the defuzzifier component of a FLS. Defuzzification is performed according to the membership function of the output variable. For instance, assume that we have the result in the figure below at the end of the inference. In this figure, the shaded areas all belong to the fuzzy result. The purpose is to obtain a crisp value, represented by the dotted line in the figure below, from this fuzzy result.



The crisp value (or belief) is then converted back to a setpoint change using the defuzzy function.

A3 - Basic principles of Model Based Control (MBC)

Sumps and surge tanks form a buffer between processes, and can be used to reject large disturbances and thereby improve stability in downstream operations. They typically resemble the diagram below, with multiple input lines (some possibly unmeasured) and a single discharge.



Fundamentally, the change in sump volume (dV/dt) is equal to the net flow into the sump, or:

$$\frac{dV(t)}{dt} = F_{in}(t) - F_{out}(t)$$

Where: F_{in} and F_{out} = respective flow measured in m^3/s

Integrating to get the current sump volume:

$$V(t) = \int_0^{t} F_{in}(\tau) - F_{out}(\tau)d\tau = \int_0^{t} \Delta F(\tau)d\tau$$

This is the principle on which all derivations are done The sump tank is a pure integrating process, where the model based control aims to minimize flow out deviation by modifying the sump level via its derivative DeltaF(t).

To minimize the discharge flowrate variation, there are two basic approaches the model based controller can take:
1. Delay control action until it is really necessary, or
2. Perform minimal control action now in the event that it will stave off drastic changes later.

Principle: There exists a time Tc such that if we ramp Fout(t) at a rate of Mout then we will be at capacity at Tc, with a net flowrate of zero, given that Fin(t) remains constant.

This implies that we begin the ramp now, and depending on the volume between the capacity and our current level, we will reach the capacity limit at Tc. Therefore if there is a large DeltaV (effectively - capacity available), the ramp will have an extremely slow rate and the flow out will hardly be affected, whereas if we are at capacity (DeltaV), the flow out will track the flow in. It is possible to even allow for discharge flow overshoot if we are over capacity.

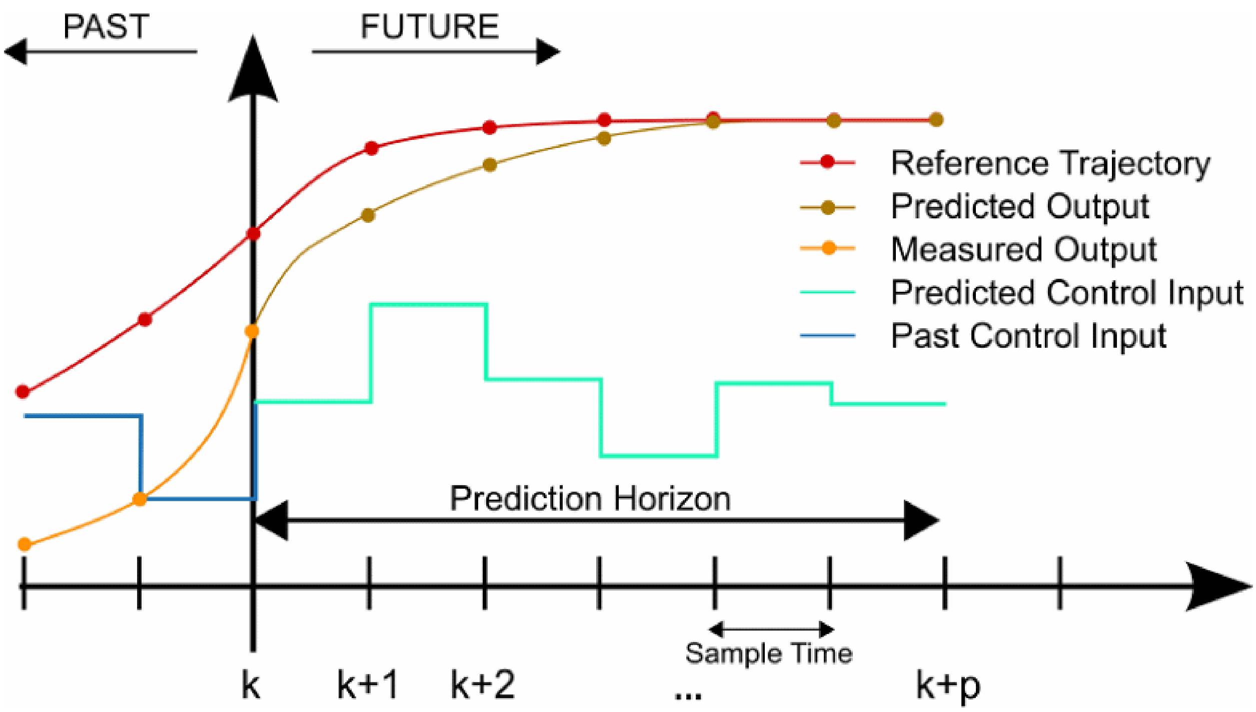
A4 - Basic principles of Model Predictive Control (MPC)

Model predictive control (MPC) is an advanced method of process control that has been in use in the process industries in chemical plants and oil refineries since the 1980s. Model predictive controllers rely on dynamic models of the process, most often linear empirical models obtained by system identification. Dynamic process models describe how the process parameters will respond in the future for changes made to the process in the present time. These models can therefore predict process responses into the future. The main advantage of MPC is the fact that it allows for the current process conditions (current timeslot) to be optimized, while accounting for future process conditions (future timeslots) still to happen as a result of changes to the current process conditions. This is achieved by optimizing over a finite time-horizon (the future predictions), implementing the current timeslot actions and then relying on feedback to account for unmeasured disturbances and model/plant mismatches. This implies that the model prediction error that may exist (or develop over time) is also taken into account by the MPC algorithm. MPC models therefore do not have to be 100% accurate. As a result of this the MPC technology is very robust, and typically outperforms most other advanced process control techniques. The MPC further has the ability to anticipate/predict future events and can take control actions accordingly. An example of this is that the MPC can predict that the bin level will drop below the low level limit, which will result in the feeder being interlocked and stopped. The feeder stop will again cause the bin level to increase sharply. The MPC can take all of these future predictions into account and prevent this scenario from happening. PID controllers normally implemented as part of the base layer (PLC) control do not have this predictive ability. Therefore the PID controller in the base layer (PLC) control will not be able to prevent the above feeder interlock and stop.

The models used in MPC are generally intended to represent the behaviour of complex dynamic systems, which cannot be effectively controlled by base layer (PLC) controllers such as PID controllers. Dynamic characteristics that are difficult for PID controllers include large time delays, variable interaction and high-order dynamics.

MPC uses current and historical plant responses/measurements, the current dynamic state of the process, the MPC models, and the process variable targets and limits to calculate future changes in the dependent variables (the variables to be controlled, such as bin levels and product mass flowrates). These changes are calculated to hold the dependent variables close to target while honoring constraints on both independent (the levers that can be pulled by the MPC system, such as feeder speeds or PID setpoints) and dependent variables. The MPC typically sends out only the first setpoint change (of the sequence of calculated changes required going into the future) in each independent variable to be implemented, and repeats the calculation when the next change is required (by updating the sequence of calculated changes required going into the future).

Below is an image to illustrate the concepts:



In summary, Model Predictive Control (MPC) is a multivariable control algorithm that uses:
1. an internal dynamic model of the process
2. a history of past control moves and
3. an optimization cost function J over the receding prediction horizon,
to calculate the optimum control moves.

An example of a quadratic cost function for optimization is given by:

$$J = \sum_{i=1}^{N} w_{x_i}(r_i - x_i)^2 + \sum_{i=1}^{N} w_{u_i}\,\Delta u_i{}^2$$

With:

X_i = *i*-th controlled variable (e.g. measured bin level)

r_i = *i*-th reference variable (e.g. required bin level)

u_i = *i*-th manipulated variable (e.g. feeder speed)

w_{Xi} = weighting coefficient reflecting the relative importance of X_i

w_{ui} = weighting coefficient penalizing relative big changes in u_i