**SCADA\_PRC\_VIRTUAL\_FLOW**

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| **Version** | **Release Notes** |
| 2.0 | Conversion to AOI |

**Description**: This UDT is to be used for estimating flow based on level transmitter readings.

**Naming Convention**: Fragment four should be specified as ‘FX’ to indicate a calculated flow e.g. BXX\_DIH1\_FX1.

**UDT Members**

| **UDT Member** | **Datatype** | **Description** | **Usage** |
| --- | --- | --- | --- |
| ADDON | Virtual\_Flow\_Meter\_v1 | Flow Calculation AOI | Deploy in a routine within Devices Program |
| AI\_CV | REAL | Flow Last Discharge Cycle | Used on HMI |
| AI\_EM | REAL | Wet Well Zero in Metres | Used to estimate flow rate and pumped volume |
| AI\_XM | REAL | Wet Well Span in Metres | Used to estimate flow rate and pumped volume |

**AOI**

| **AOI Parameter** | **Requirement** | **Default Value** | **Description** | **Implementation Guideline** |
| --- | --- | --- | --- | --- |
| Average\_Flow | Mandatory | *Tagname*.AI\_CV | Average Flow from Last Pump Cycle in m3 | N/A |
| WetWell\_Level\_MinSpan | Mandatory | *Tagname*.AI\_EM | Wet Well Zero in metres | N/A |
| WetWell\_Level\_MaxSpan | Mandatory | *Tagname*.AI\_XM | Wet Well Span in Metres | N/A |
| Wet\_Well\_Area | Mandatory | Hardcoded | Cross-sectional area of the wet well | N/A |
| Duty\_Pump\_Start | Mandatory | *Tagname*.ADDON.Duty\_Pump\_Start | Duty Pump Started | Program outside of the AOI to indicate that at least one duty pump has been requested to start |
| Duty\_1\_Start | Mandatory | Dty1.Sts.Auto\_Start tag from duty pump UDT | Auto Start Command of Duty 1 Pump | N/A |
| Duty\_1\_Stop | Mandatory | Dty1.Sts.Auto\_Stop tag from duty pump UDT | Auto Stop Command of Duty 1 Pump | N/A |
| Duty\_1\_Start\_SP | Mandatory | Dty1.Sts.AI\_TS tag from duty pump UDT | Duty 1 Level Start Setpoint in % | N/A |
| Duty\_1\_Stop\_SP | Mandatory | Dty1.Sts.AI\_PS tag from duty pump UDT | Duty 1 Level Stop Setpoint in % | N/A |
| SYS\_Day\_Reset | Mandatory | SYS\_Day\_Reset | Daily Reset Flag | N/A |
| Daily\_Total | Mandatory | Map to AI\_TD tag of an analog UDT | Flow total today | N/A |
| Daily\_Total\_Yesterday | Mandatory | Map to AI\_YT tag of an analog UDT | Flow total yesterday | N/A |

**AOI Operation Description**

The first two rungs of the AOI compute the amount of volume that is pumped in the duty pump cycle. The effective span of the wet well transmitter is calculated by subtracting the zero setpoint from the span setpoint. The start and stop elevations can then be computed by multiplying the start and stop level setpoints (in %) by the effective span. Finally, the volume of water to be pumped can be estimated by subtracting the start level from the stop level and multiplying by the cross-sectional area of the well.

The next six rungs track emptying and filling time for the well. When one of the duty pumps is requested to start, the well is deemed to be emptying until the duty pump 1 stop request is triggered. This transitions the wet well to “filling” mode, until the duty pump 1 start request is seen. Based on the time spent in “fill” mode, the inflow rate to the wet well can be estimated by dividing the pumped volume by the fill time.

The total amount of water pumped during an emptying cycle is the water volume defined by the duty pump 1 start and stop setpoints, plus whatever water flowed into the wet well during the emptying cycle. The latter value is computed by multiplying the fill rate by the time spent in “Emptying” mode. This volume is then added to the volume of water within the duty 1 pump limits to determine the total amount of water pumped out of the well. Dividing this volume by the time to empty the wet well estimates the flow in L/s.

The total volume of water pumped is totalized in m3 and resets daily.

**Programming Examples**

This AOI should only be used in applications where a real discharge flow meter is not available, but an estimation of flow out of the wet well is still required. It should be noted that this UDT will only produce an approximation of the flow data and will not be accurate in situations where high flows call for multiple duty pumps or the system is running on backup control.

The flow rate calculated by this block can be used as the raw input for an analog instrument UDT if alarming or additional signal monitoring/conditioning is required. It is generally recommended to create this tag, regardless, so that the totalizer tags may be used in the calculated flow UDT. This would allow for the creation of a tag with FI1 as the fourth fragment and allow for simplified integration if a real flowmeter were installed in the future.

**HMI Integration**

There are no specific integration requirements for this UDT.