Alarm Management

Alarm Standards

Process alarms are used to draw the operator's attention to an abnormal condition that, if disregarded, could lead to poor product quality, unplanned downtime, damaged assets, personnel injury or a catastrophic accident. Alarm management is one of many layers of protection to prevent the escalation of a hazard into an accident.

Standards

In 2009, the standard ANSI/ISA-18.2, "Management of Alarm Systems for the Process Industries" (ISA-18.2) was released. It provides guidance that helps users design, implement and maintain an alarm system in order to optimize performance for an operator response to alarm. ISA-18.2 was used as the starting point for the creation of an international standard, IEC 62682, which was released in 2014. The ISA-18.2 standard is considered a recommended and generally accepted good engineering practice (RAGAGEP) by insurance and regulatory agencies.

Most process industry plants are driven to create additional productivity/efficiency and extend the life of their assets. One of the easiest and most effective ways to do this is to address a poorly performing alarm system and its effect on operator performance.

What is an Alarm?

According to the standards, an alarm is defined as an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition that requires a response. When employed appropriately, alarms help the operator to keep the plant running safely and within normal operating conditions. If alarms instead serve as a distraction or nuisance, then the performance of the operator suffers.

	Action Required	Information
Abnormal	Alarm	Alert
Expected	Prompt	Message

A message like "mixer running normally" should not be classified as an alarm because it is information and requires no action from the operator. Message other than alarms distract the operator.

Basic vs Advanced Reporting

XLReporter provides alarm reports at two levels: **Standard** and **Advanced**.

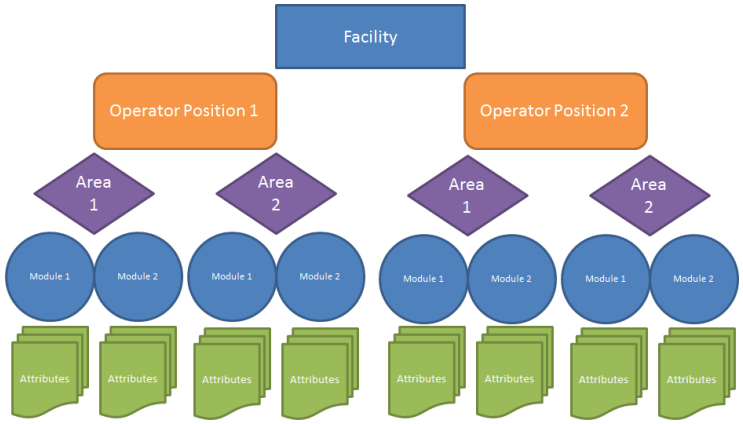
Standard reports are available with every version of **XLReporter** that supports database connectors. These types of reports provide a partial list of the alarm metrics and information suggested by ISA-18.2 and IEC62682 standard. This is an ideal start to alarm management.

Advanced reports are available with the ISA-18.2 Alarm Management Module which is an addition to **XLReporter**. The addition measures all the metrics suggested by the ISA-18.2 and IEC62682 standard and provides the necessary information that will help you identify systematic design issues and specific areas for improvement. This is the subject of this documentation.

Alarm Hierarchy

XLReporter considers the alarm hierarchy discussed below. Not every alarm system supports this hierarchy and so, by configuration, it can be modified.

In the hierarchy, alarms are generated from modules (tags) which have attributes (e.g., HIHI). The modules belong to Areas (locations in the facility) which are managed from Operator Positions. Collectively this is all part of a Facility. The hierarchy is depicted in the following diagram.



Alarm Cycle

Alarms are usually in one of the following states:

- **Active-Unacknowledged**
  This signifies the occurrence of a new alarm (start of cycle). The alarm is active and has not been acknowledged by the operator.

- **Active-Acknowledged**
  This signifies that the alarm is active and has been acknowledged by the operator.

- **Inactive-Unacknowledged**
  This signifies that the alarm is not active and has not been acknowledged by the operator.

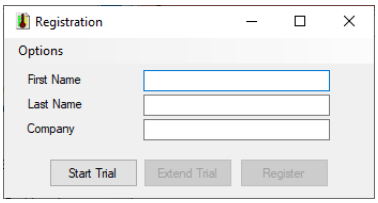
- **Inactive-Acknowledged**
  This signifies the end of the alarm cycle. The alarm is inactive and has been acknowledged by the operator.

Other irregular states such as *Disabled* and *Suppressed* are also possible.

To determine the ISA metrics, each of these states have to be identifiable in the alarm system. Alarm systems from different vendors have different methods of determining these states. **XLReporter** provides settings for the alarm states as part of the **Connector** definition (see later).

Registration

Before you begin, enable the software to run either in evaluation or full mode. From the **XLReporter Project Explorer**, on the right-side **Tools** tab click **Register**.



Evaluation License

Enter the information required and select **Start Trial** to start the evaluation. When the evaluation period expires, you can re-open this display and select **Extend Trial**.

The evaluation license runs continuously for two hours and **limits the information that is returned from the Alarm Management connector**. When the product is registered with an Advanced Module license, this limit is removed.

Full License

For information on registering a license, see the **Product Registration** document.

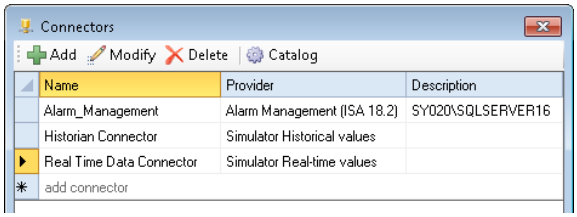
Predefined Templates

Overview

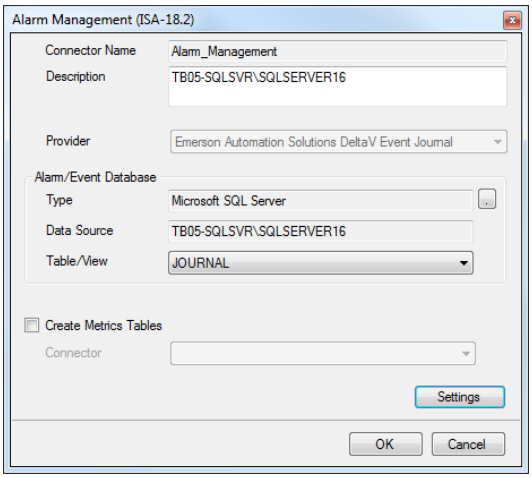
When an alarm management connector is created, a set of predefined templates are automatically added to the current project. These templates are fully functional but will limit their output if a full license is not present.

Define the Connector

From the **XLReporter Project Explorer** on the right-side **Tools** tab, in the **Connect** section click **Connectors** to display the connectors defined in the project. This same display appears when creating a new project.



- Click **Add**.
- Expand **Advanced Modules** and select **Alarm Management (ISA-18.2)**
- Click **OK**.



In this display, provide information about your alarm system database.

- Set the **Provider**.

Under **Alarm/Event Database**

- Connect to the database where the alarms are being logged.
- For **Table/View**, select the table or view containing the alarm data. Typically, this is defaulted once the **Data Source** is specified.

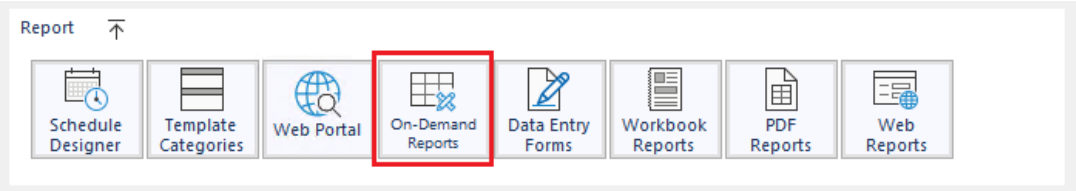
Click **Settings**.

- Under the **Facility** tab enter **Name** and **Location**.
- Click **OK**
- Click **OK** again.
- Close **Connectors.**

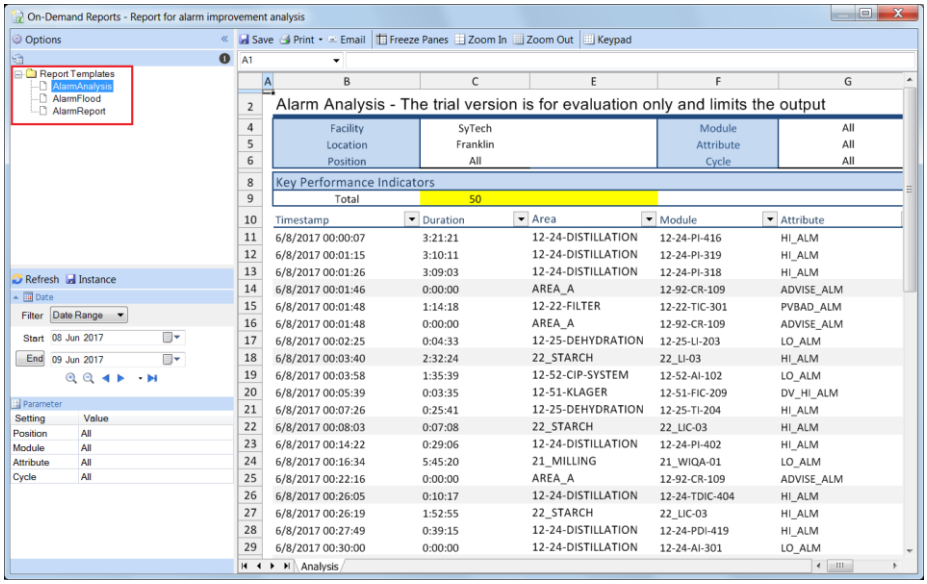
When the connector is saved, several templates are added to the project that can be used "out of the box".

Report On-Demand

The predefined templates can be used on-demand to produce reports using custom settings. From the **Project Explorer**, on the right-side **Tools** tab, in the **Report** section select **On-Demand Reports.**



The **On-Demand Reports** application shows with the templates added to the project in the left pane.

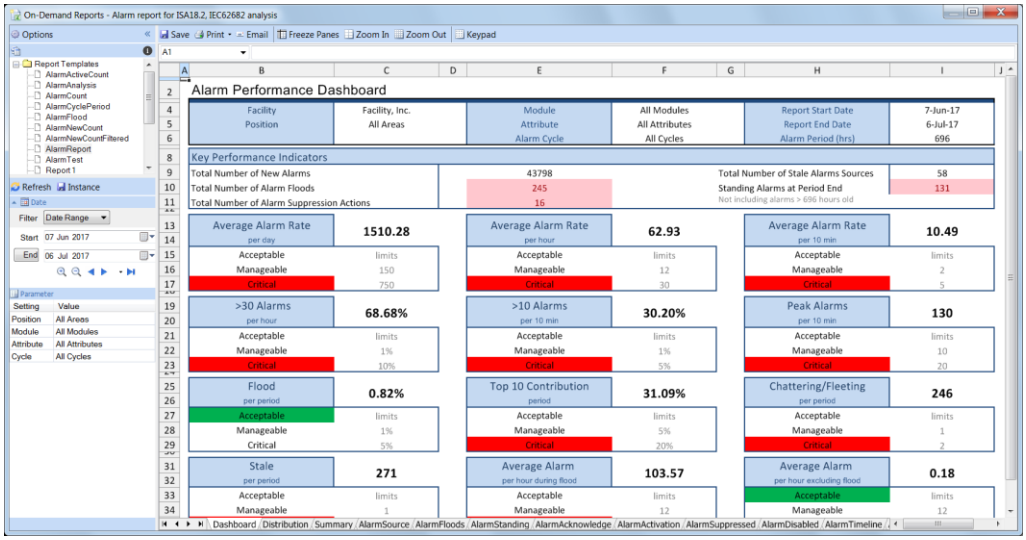


AlarmReport

The **AlarmReport** is a comprehensive multi-sheet report that displays alarm analysis described in ISA-18.2 standard. A dashboard is the first provides an "at-a-glance" view of the alarm system and the other sheets provide detailed information that support the KPIs.

A report is produced on-demand by specifying settings for the *Start/End* dates, *Position*, *Module* and *Attribute*. In the case of *Position*, *Module* and *Attribute*, they need to be setup in the Alarm Connector in advance (see **Connector**).

Enter input settings and click **Refresh**.



Note that in trial mode only the *Dashboard* and *AlarmSummary* reports are displayed.

Dashboard

The report shows the compliance metrics as a dashboard together with the recommended limits (which can be modified in the template). Each metric is rated according to the limits and color coded for easy detection of non-compliance.

Alarm Summary

The report shows the primary KPIs and metrics performance indicators. It also shows the distribution of the new alarms by configuable group levels for each day in the report period. For the most active day, the distribution is shown by hour.

Alarm Source

The report shows the sources of new alarm activity in descending order of alarm occurance (bad actors). The top 20 most active alarms are shown in a pareto chart to determine the percentage effect of the active alarms to the whole.

Alarm Floods

The report shows the occurrence of each alarm flood as sdefined in the template. By default, a flood starts with more than 10 alarms in 10 minutes and ends with less than 5 in 10 minutes. The report also shows the peak of the flood and the total new alarms that occurred during the flood.

Alarm Standing

The report shows the alarms that are active at the end of the report period.

Alarm Acknowledge

The report shows a summary of the alarm acknowledgement time. The metrics are based on the time taken for an active alarm to be acknowledged.

Alarm Activation

The report shows a summary of the alarm activation time. The metrics are based on the time taken for an active alarm to become inactive.

Alarm Suppressed

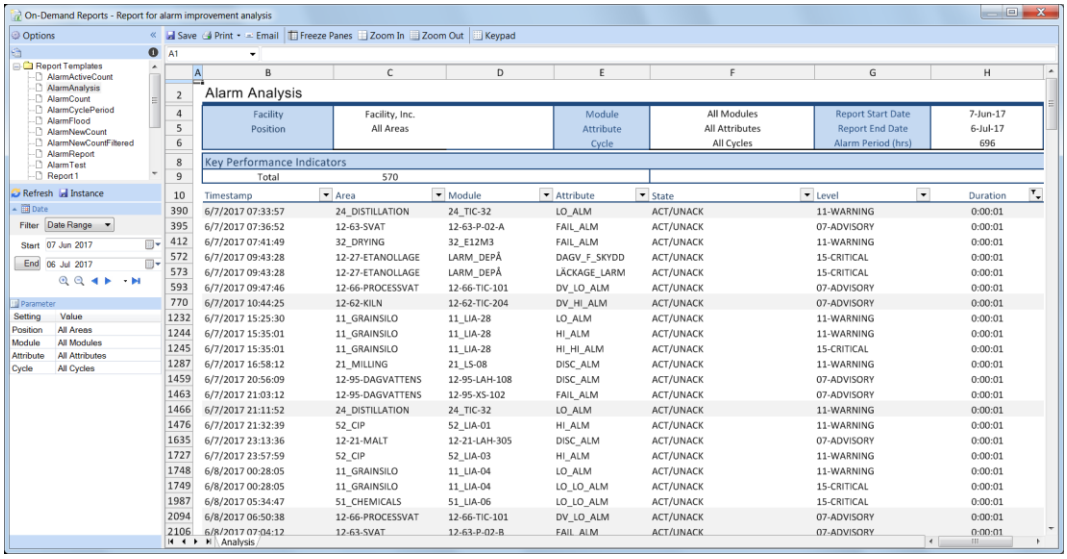
The report shows a list of alarms that are suppressed during the alarm period. Note that this is not supported by every alarm system. An indicator shows if they are in that state at the end of the period.

Alarm Disabled

The report shows a list of alarms that are disabled during the alarm period. Note that this is not supported by every alarm system. An indicator shows if the alarms are in the disabled state at the end of the period. In this scenario the final disabled alarm message is not considered in the overall count.

AlarmAnalysis

The alarm analysis report is a powerful environment to understand alarm behavior. It is primarily used to determine and track alarm details in order for effective diagnosis and repair.



Note that in trial mode only the first 50 rows of data are displayed.

The report shows every new alarm occurrence and the duration of how long it was active. By using the *Duration* column filter alarms with short alarm activity (chattering) and long alarm activity (stale) can easily be detected. By combining this filter with *Level* column, critical alarms on a short alarm cycle can be determined.

Key Performance Indicators

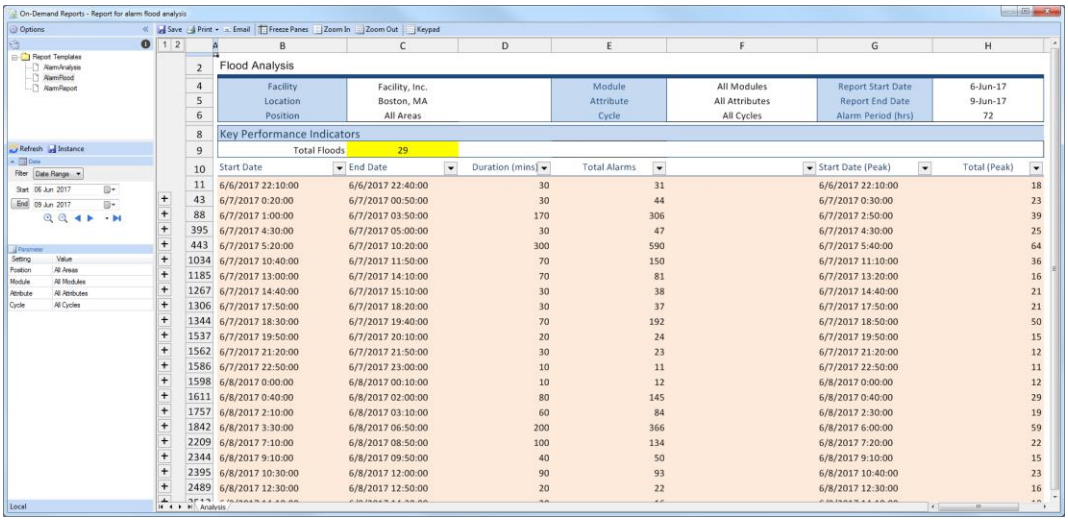
Total 13

Timestamp	Area	Module	Attribute	State	Level	Duration
6/7/2017 15:35:01	11_GRAINSILO	11_LIA-28	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/8/2017 00:28:05	11_GRAINSILO	11_LIA-04	LO_LO_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/8/2017 13:17:43	11_GRAINSILO	11_LIA-28	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/11/2017 09:59:45	11_GRAINSILO	11_LIA-04	LO_LO_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/20/2017 05:44:28	11_GRAINSILO	11_LIA-26	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/20/2017 09:09:05	11_GRAINSILO	11_LIA-04	LO_LO_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/21/2017 12:50:09	11_GRAINSILO	11_LIA-25	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/21/2017 13:30:12	11_GRAINSILO	11_LIA-28	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/25/2017 08:01:49	11_GRAINSILO	11_LIA-02	LO_LO_ALM	ACT/UNACK	15-CRITICAL	0:00:01
6/30/2017 11:59:55	11_GRAINSILO	11_LIA-04	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
7/2/2017 08:07:02	11_GRAINSILO	11_LIA-04	LO_LO_ALM	ACT/UNACK	15-CRITICAL	0:00:01
7/2/2017 12:00:20	11_GRAINSILO	11_LIA-01	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01
7/4/2017 13:55:39	11_GRAINSILO	11_LIA-28	HI_HI_ALM	ACT/UNACK	15-CRITICAL	0:00:01

In the above, there were 13 occurences of critical alarms in the *11-GRAINSILO* area initiated from the modules 11_LIA_01,_02,_04,_25,_26 and 11_LIA_28.

AlarmFlood

The alarm flood report allows further analysis of the flood activity presented on the **Alarm Floods** subreport in the **Alarm Report**.



Flood Analysis

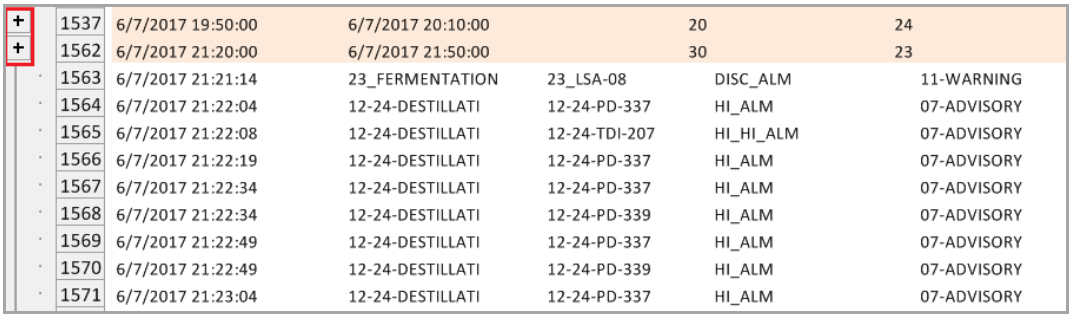
Facility	Facility, Inc.	Module	All Modules	Report Start Date	6-Jun-17
Location	Boston, MA	Attribute	All Attributes	Report End Date	9-Jun-17
Position	All Areas	Cycle	All Cycles	Alarm Period (hrs)	72

Key Performance Indicators

Total Floods: 29

Start Date	End Date	Duration (mins)	Total Alarms	Start Date (Peak)	Total (Peak)
6/6/2017 22:10:00	6/6/2017 22:40:00	30	31	6/6/2017 22:10:00	18
6/7/2017 0:20:00	6/7/2017 00:50:00	30	44	6/7/2017 0:30:00	23
6/7/2017 1:00:00	6/7/2017 03:50:00	170	306	6/7/2017 2:50:00	39
6/7/2017 4:30:00	6/7/2017 05:00:00	30	47	6/7/2017 4:30:00	25
6/7/2017 5:20:00	6/7/2017 10:20:00	300	590	6/7/2017 5:40:00	64
6/7/2017 10:40:00	6/7/2017 11:50:00	70	150	6/7/2017 11:10:00	36
6/7/2017 13:00:00	6/7/2017 14:10:00	70	81	6/7/2017 13:20:00	16
6/7/2017 14:40:00	6/7/2017 15:10:00	30	38	6/7/2017 14:40:00	21
6/7/2017 17:50:00	6/7/2017 18:20:00	30	37	6/7/2017 17:50:00	21
6/7/2017 18:30:00	6/7/2017 19:40:00	70	192	6/7/2017 18:50:00	50
6/7/2017 19:50:00	6/7/2017 20:10:00	20	24	6/7/2017 19:50:00	15
6/7/2017 21:20:00	6/7/2017 21:50:00	30	23	6/7/2017 21:20:00	12
6/7/2017 22:50:00	6/7/2017 23:00:00	10	11	6/7/2017 22:50:00	11
6/8/2017 0:00:00	6/8/2017 00:10:00	10	12	6/8/2017 0:00:00	12
6/8/2017 0:40:00	6/8/2017 02:00:00	80	145	6/8/2017 0:40:00	29
6/8/2017 2:10:00	6/8/2017 03:10:00	60	84	6/8/2017 2:30:00	19
6/8/2017 3:30:00	6/8/2017 06:50:00	200	366	6/8/2017 6:00:00	59
6/8/2017 7:10:00	6/8/2017 08:50:00	100	134	6/8/2017 7:20:00	22
6/8/2017 9:10:00	6/8/2017 09:50:00	40	50	6/8/2017 9:10:00	15
6/8/2017 10:30:00	6/8/2017 12:00:00	90	93	6/8/2017 10:40:00	23
6/8/2017 12:30:00	6/8/2017 12:50:00	20	22	6/8/2017 12:30:00	16

Each row indicating a flood is collapsed by default and is expandable to show individual alarm attributes that were activated during the flood.



+	1537	6/7/2017 19:50:00	6/7/2017 20:10:00		20	24
+	1562	6/7/2017 21:20:00	6/7/2017 21:50:00		30	23
	1563	6/7/2017 21:21:14	23_FERMENTATION	23_LSA-08	DISC_ALM	11-WARNING
	1564	6/7/2017 21:22:04	12-24-DESTILLATI	12-24-PD-337	HI_ALM	07-ADVISORY
	1565	6/7/2017 21:22:08	12-24-DESTILLATI	12-24-TDI-207	HI_HI_ALM	07-ADVISORY
	1566	6/7/2017 21:22:19	12-24-DESTILLATI	12-24-PD-337	HI_ALM	07-ADVISORY
	1567	6/7/2017 21:22:34	12-24-DESTILLATI	12-24-PD-337	HI_ALM	07-ADVISORY
	1568	6/7/2017 21:22:34	12-24-DESTILLATI	12-24-PD-339	HI_ALM	07-ADVISORY
	1569	6/7/2017 21:22:49	12-24-DESTILLATI	12-24-PD-337	HI_ALM	07-ADVISORY
	1570	6/7/2017 21:22:49	12-24-DESTILLATI	12-24-PD-339	HI_ALM	07-ADVISORY
	1571	6/7/2017 21:23:04	12-24-DESTILLATI	12-24-PD-337	HI_ALM	07-ADVISORY

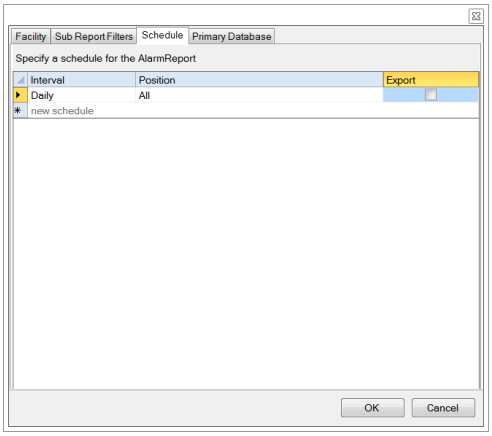
Note that in trial mode only the first 20 flood occurrences are displayed, and only the first 20 rows of flood details are displayed.

Report Automatically

Set the Schedule

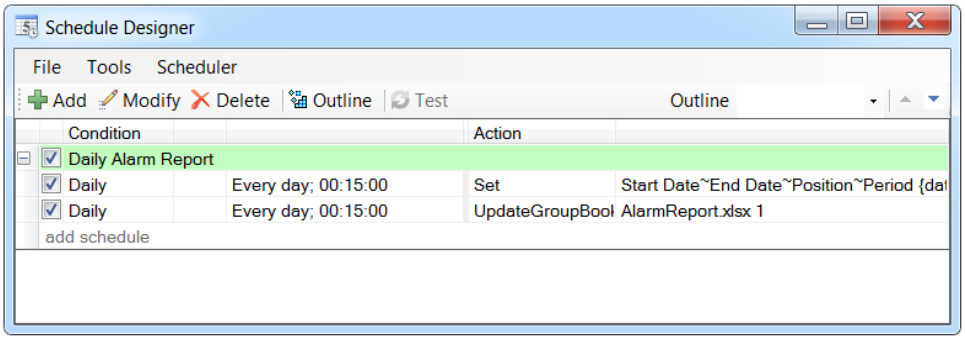
The predefined templates can be scheduled to produce reports automatically. Special consideration is given to the *AlarmReport* since its schedule can be produced from configuration. From the **Project Explorer**, on the right-side **Tools** tab in the **Connect** section select **Connectors** and open the connector.

- Click **Settings**
- Click the **Schedule** tab



- In the top row under **Interval** select *Daily*.
- Set **Postion** to *All*.
- Click **OK**.
- Close **OK** again to save the connector.
- Close Connectors.

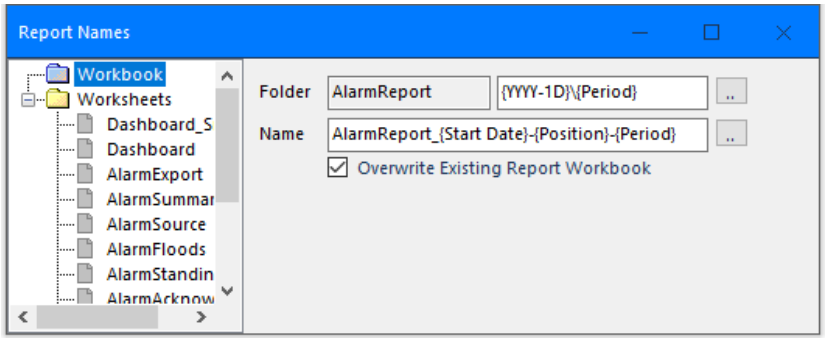
When the settings are saved, a schedule is automatically configured.



This can be viewed and modified in the **Schedule Designer**.

Report Names

The naming convention followed by the report is specified in the **Report Names** option of the template. This can be viewed by opening the *AlarmReport* template in the **Template Studio** and selecting **Report Names** under the **Report** tab.



By default

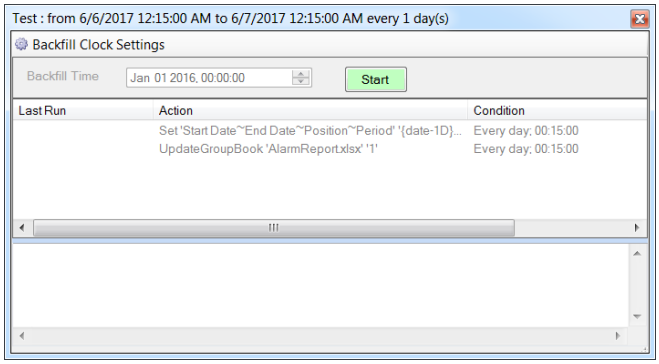
- A **Folder** after the year containing a sub folder named after the **Period**
- A **Name** as a combination of the **Start Date** of the report, **Position** and **Period**

For example, a weekly report for the *All* position covering *10th Jan, 2021* to *16th Jan, 2021* would be stored in the folder **2021\Weekly** with the name **AlarmReport-2021-01-10-All-Weekly**.

Backfilling Reports

A powerful feature of the Scheduler is that it can be executed at a specified date/time in contrast to when it is running in the background and using the current date/time.

From the **Project Explorer**, on the right-side **Tools** tab in the **Report** section, open the **Schedule Designer**. Highlight the schedule lines to execute and choose **Tools, Report Backfill**.



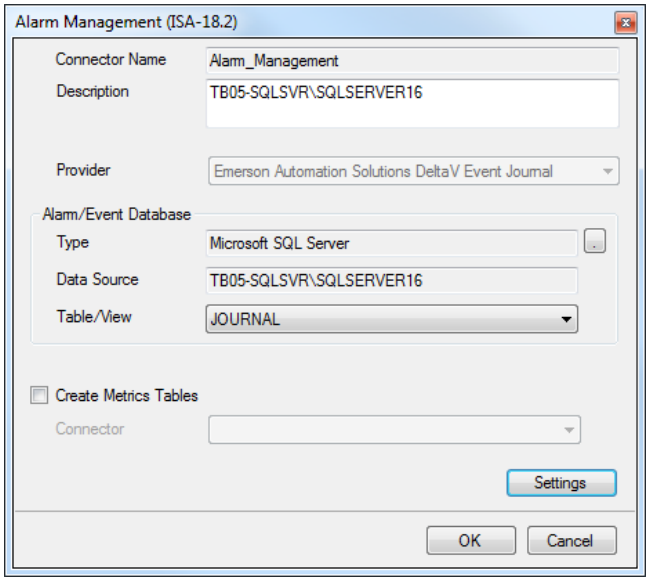
The selected schedule lines are listed. The caption shows the time period of the backfill when the **Start** button is clicked. Use **Backfill Clock Settings** to modify the date range (make sure that it reflects the schedule e.g., if the schedule is at 00:15:00 then the backfill clock should be the same).

Connector

Overview

Now that you have seen some of what the Alarm Management connector can do, let's take a deeper look into what is available.

Alarm Management Connector



Provider

The **Provider** setting contains a list of vendor specific alarm databases. The **Provider** selection supplies default settings for the connector which can be changed if needed.

Alarm/Event Database

These settings define how to connect to the database as well as what Table/View contains the alarm/event records.

Typically, the **Table/View** is defaulted correctly once the **Data Source** is specified.

Metrics Table

When the data connector is saved, one of the templates automatically added to the project is called *AlarmReport* which contains key alarm metrics of the alarm system and the underlying alarms that influence the KPI. These KPIs can be exported periodically, such as every day, to an external database. With the KPIs stored in the **Metrics Table**, long term trends can be produced.

When **Create Metrics Tables** is checked, the **Connector** list is enabled and provides a list of every other connector in the project that is connected to a database.

If this option is enabled, when the connector is saved, the **Update Database** window appears showing that new tables have been added to the database to receive the KPI/alarm information.

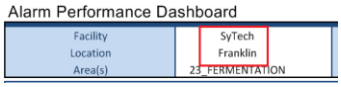
Done	DROP TABLE TableKPI
Done	DROP TABLE TableTop10
	' Create KPI table
Done	CREATE TABLE TableKPI (Facility VARC
Done	CREATE INDEX TableKPIIndex ON Table
	'Create Top 10 Table
Done	CREATE TABLE TableTop10 (Facility VA

Settings

The **Settings** button is used to access specific settings for the connector.

Facility Tab

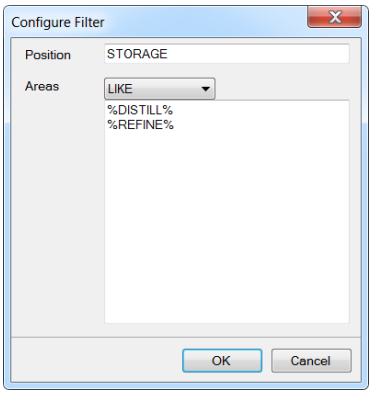
The **Facility** tab shows general information about the location of the alarm system. These settings can be used in the header of a report.



Sub Report Filters Tab

The **Sub Report Filters** tab contains the sub tabs **Alarm Duration**, **Operator Positions**, **Modules** and **Attributes**. The filters specified here are only definitions and have no effect on the output of a report until they are used.

Filters



When a filter is defined for **Operator Position**, **Modules** or **Attributes** it can use one of the following operators:

- **IN**

  When **IN** is selected, one or more conditions can be added to the list below. When the filter is used, only values that match exactly with one of the conditions is listed will be considered.

- **NOT IN**

  When **NOT IN** is selected, one or more conditions can be added to the list below. When the filter is used, any value that matches exactly with one of the conditions listed will not be considered.

- **LIKE**

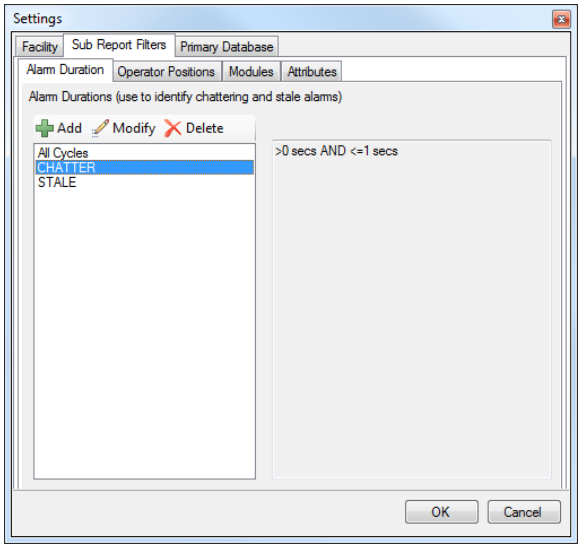
  When **LIKE** is selected, one or more conditions can be added to the list below. Each condition can contain a % wildcard for matching purposes. For example, if the conditions are
  %DISTILL%
  %REFINE%
  Any value that contains *DISTILL* or *REFINE* will be considered.

- **NOT LIKE**

  When **NOT LIKE** is selected, one or more conditions can be added to the list below. Each condition can contain a % wildcard for matching purposes. For example, if the conditions are:
  %DISTILL%
  %REFINE%
  Any value that contains *DISTILL* or *REFINE* will not be considered.

Alarm Duration

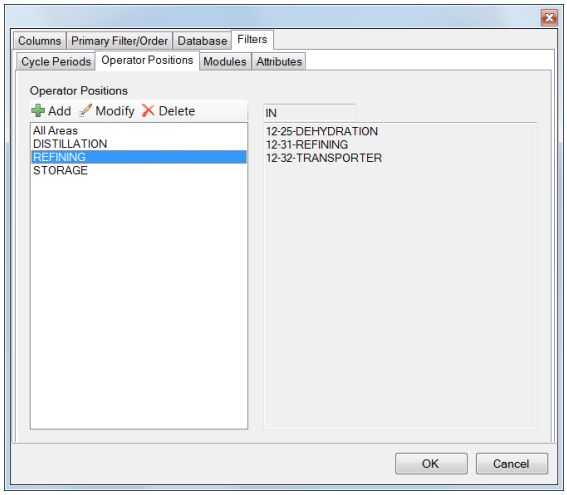
The **Alarm Duration** tab displays various periods that can be used as filters. **XLReporter** defines the alarm duration as the time between **Active-Unacknowledged** and **Inactive-*** (any inactive state).



In the example above, if a report is filtered by *CHATTER*, then only the alarms that are active for *1* second or less will be considered in the report. Avoid using symbols (<, >, ~) in the Cycle Configuration names.

Operator Positions Tab

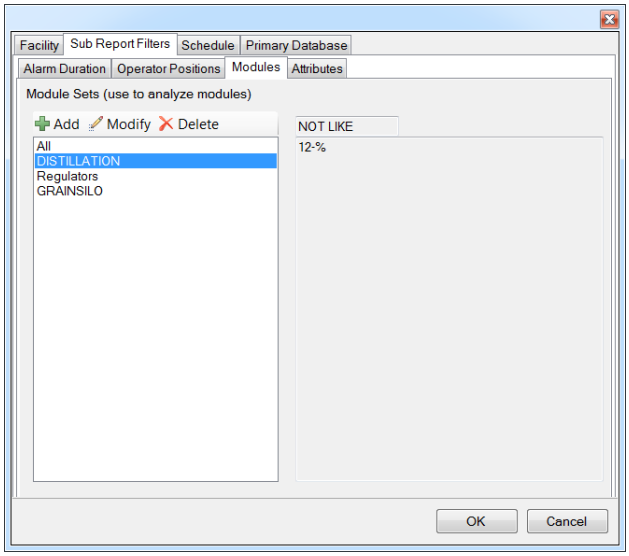
The **Operator Positions** tab is used to define the operator positions that can be used as filters. **XLReporter** defines operator positions as a collection of areas under the responsibility of an operator. If the alarm system does not support the concept of alarm areas, then this filter is not used.



In the example above, if a report is filtered by *REFINING* operator position, then only the **Areas** *IN* that definition will be considered for the report.

Modules Tab and Attributes Tab

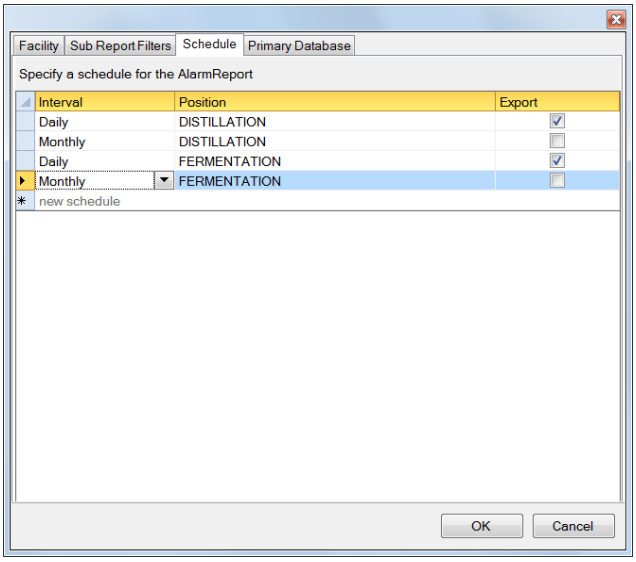
These tabs are used to define the Module/Attribute sets that can be used as filters.



In the example above, if a report is filtered by the module set *DISTILLATION*, then the **Modules** *NOT LIKE 12-%* (this represents module names not starting with *12-*) will be considered for the report.

Schedule Tab

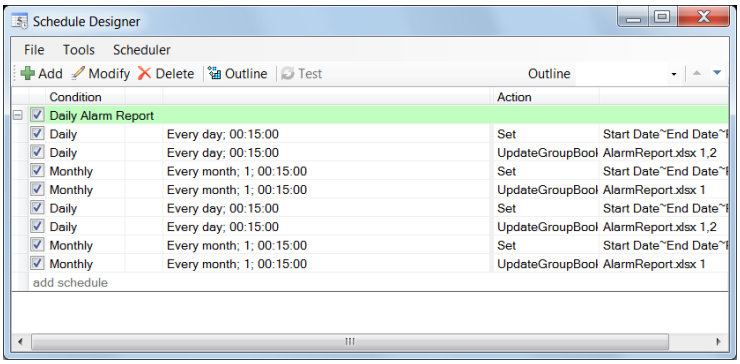
By default, all the templates provided with the alarm module can be used on-demand. In addition, the *AlarmReport* can be configured to produce reports periodically.



In the example above every day a report is generated for the *DISTILLATION* and *FERMENTATION* positions and the daily KPIs are exported to the **Metrics Table**. Every month a monthly report is generated for the *DISTILLATION* and *FERMENTATION* positions as well.

Note that the **Export** option should only be used if the **Metrics Table** has been defined.

The settings here will produce one or more schedule lines. These can be viewed in the **Schedule Designer**.

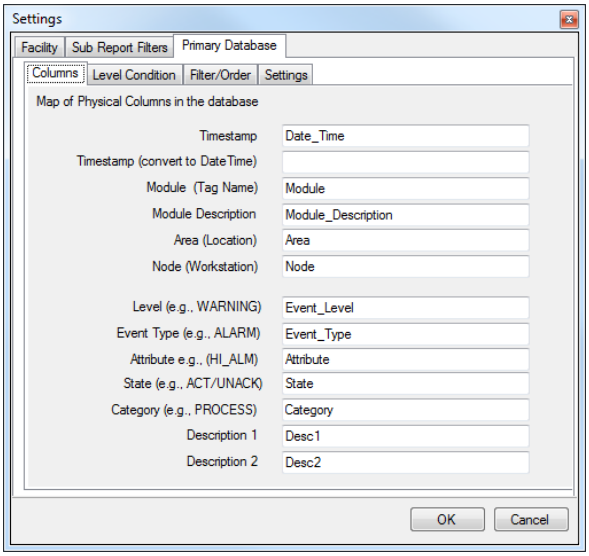


Primary Database Tab

The default settings in this tab are derived from the **Provider** selected are implementation specific. Any changes in this tab will affect every report generated. Usually, only the settings on the **Level Condition Tab** need changing based on the settings in the alarm system.

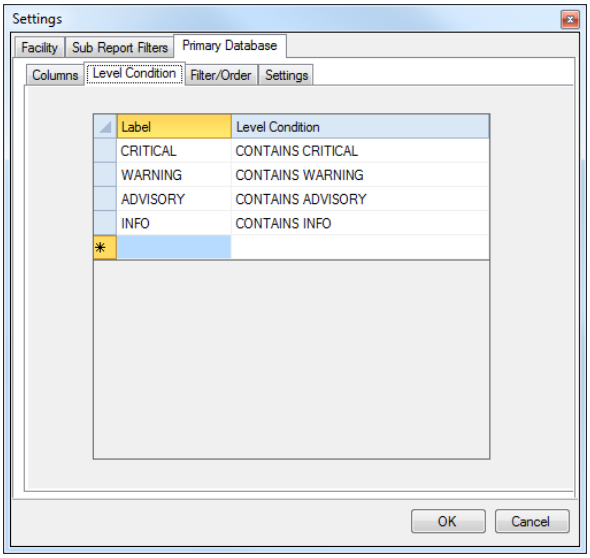
Columns Tab

The **Columns** tab defines the columns in the database table that will be used by the connector. It is rare that any setting on this tab will require a change.



Level Condition Tab

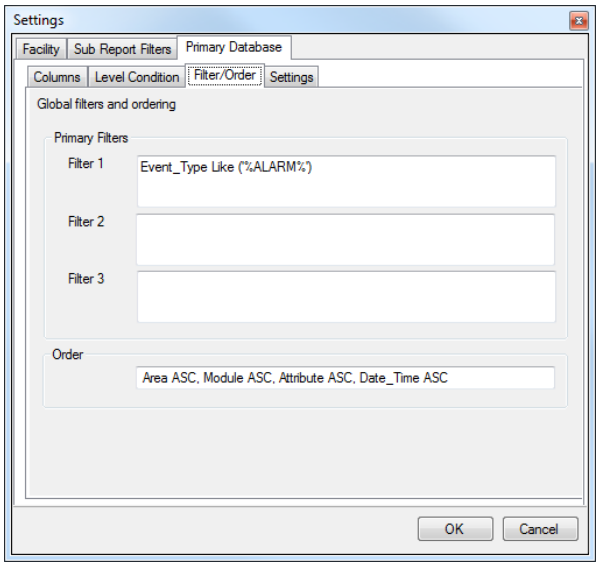
The **Level Condition** tab defines how alarm levels of the alarm system. These setting are associated with the **Level** column in the database.



- **Label**
  The label shown in the report.
- **Level Condition**
  The condition used on the **Level** column.

Filter/Order Tab

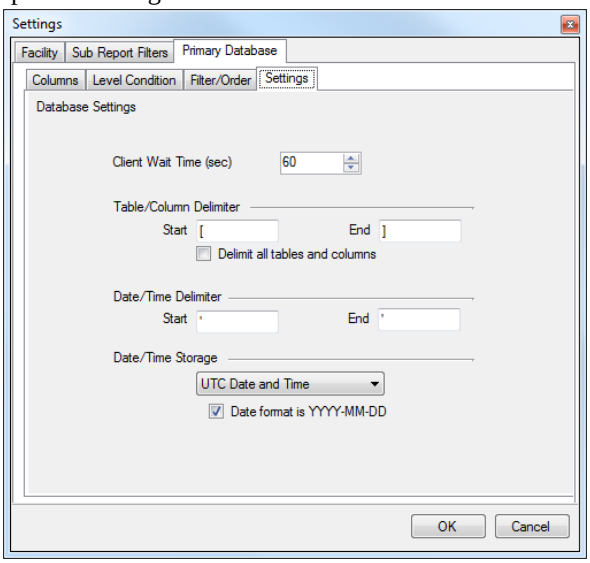
The **Filter/Order** tab shows the filters and order applied to the database data. Only the data resulting from this filter will be considered for the alarm metric calculations.



Additional filters can be specified in **Filter 2** and **Filter 3**. Note that these filters will be system wide and will affect every report in the project. Other filtering techniques are discussed later which can be applied to specific reports.

Settings Tab

The **Settings** tab shows specific settings for the database selected.



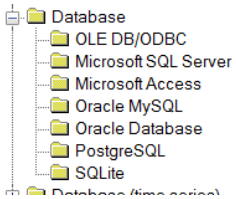
Trending Alarm KPIs

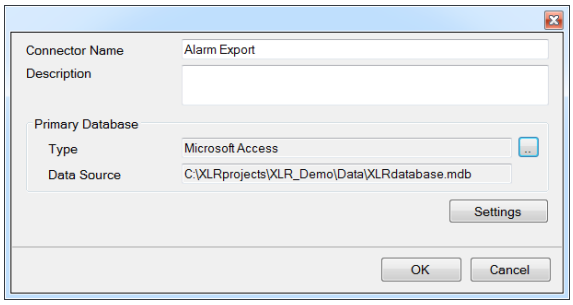
Overview

As stated earlier, the KPIs and metrics from the AlarmReport template can be exported to an external database and additional reports can then be used to trend improvements.

Select a Database to Store the KPIs

To set up the KPI database, from the **Project Explorer**, open **Connectors**. Click **Add.** Expand **Databases** and select the appropriate type.

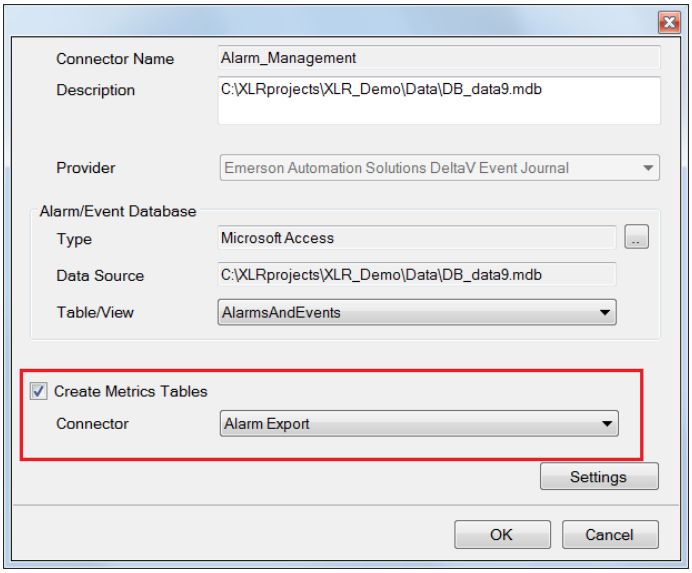




For **Primary Database** click the browse button […] for **Type** and specify the database to connect to. Once complete, click **OK** to save this connector.

Modify the Alarm Management Connector

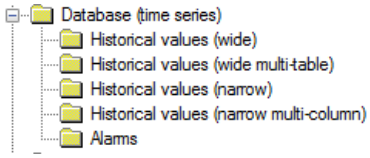
Modify the **Alarm Management** connector, check **Create Metrics Tables** and select the **Connector** configured above.



- Click **OK.**

Create a Historical Connector to Collect Metrics in Reports

To set up the reporting connector, from the **Project Explorer**, open **Data Connectors**. Click **Add.** Expand **Database (time series)** and select **Historical Values (wide)**.

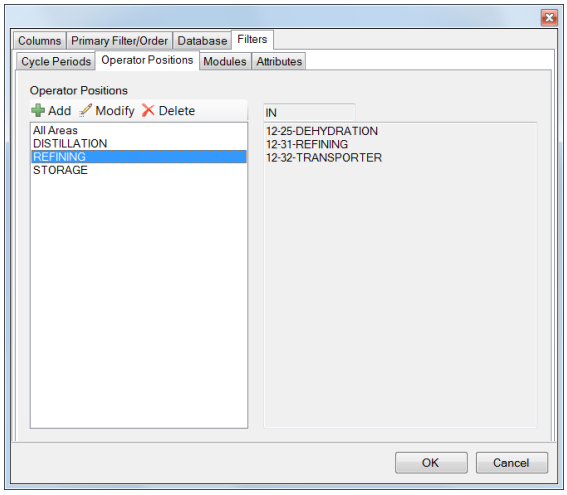


- Assign a **Name**, e.g., *Alarm KPI.*
- For **Primary Database** click the browse button […] for **Type** and specify the same database used in the export connector above.
- Set the **Table** to *TableKPI.*
- Set the **Date Column** to *DateAndTime*.

Once complete, click **OK** to save this connector.

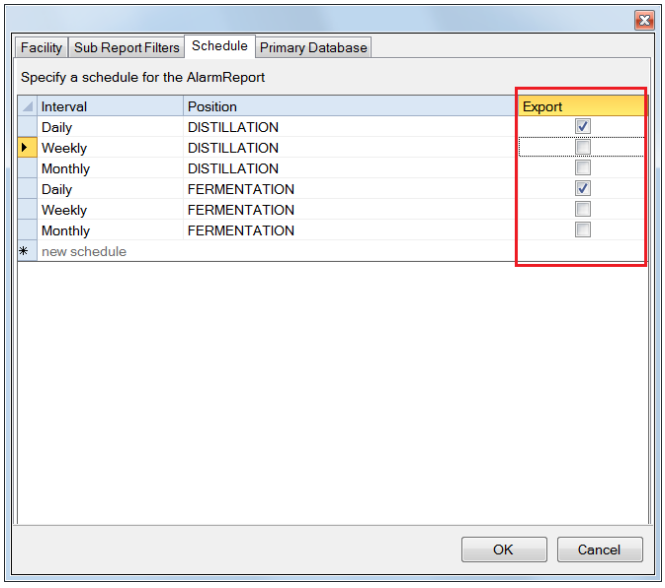
Modify the Alarm

Open **Settings** and select the **Sub Report Filters** tab.



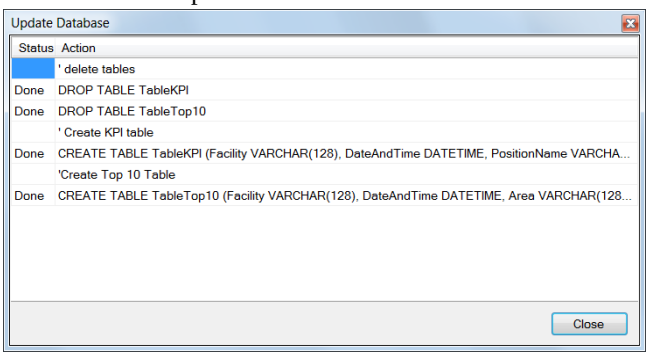
- Select the **Operator Position** tab.
- Define one or more **Positions** to areas in the facility.

Select the **Schedule** tab.



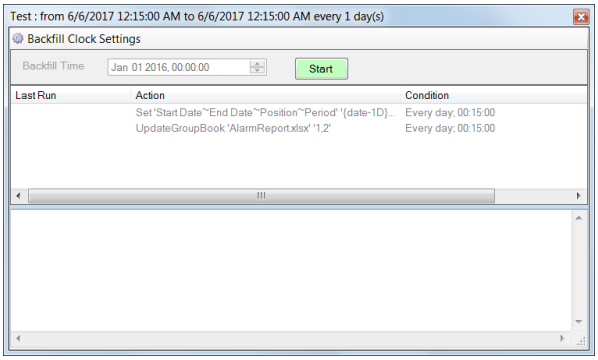
- Add a schedule line for at least one of the defined **Positions**. Set the **Interval** to *Daily* and check the **Export** column.
- Click **OK**.

Click **OK** to save the connector. A prompt will appear to reset/create the tables in the **Connector** database to receive the data from the report.



Generate the Alarm Reports and Log the KPIs

From the **Project Explorer**, open the **Schedule Designer**. Highlight the schedule lines for one of the **Position** you added. Choose **Tools, Report Backfill**.

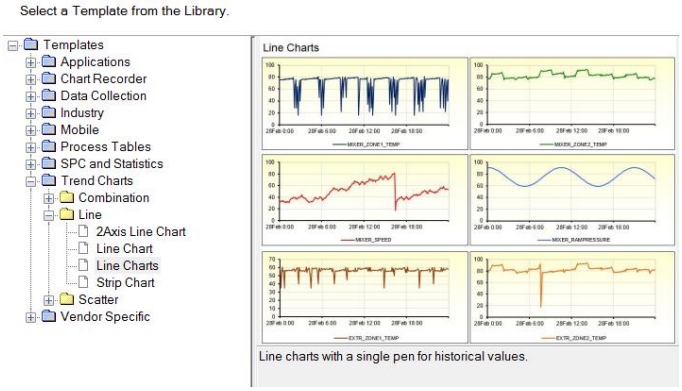


The selected schedule lines are listed. The caption shows the time period of the backfill when the **Start** button is clicked. Use **Backfill Clock Settings** to modify the date range (make sure that it reflects the schedule e.g., if the schedule is at 00:15:00 then the backfill clock should be the same).

Produce a KPI Trend

Open the **Project Explorer** and from the right-side **Tools** tab in the **Template Design** section select **Library**.

From the list of templates, expand **Trend Charts**, **Line** and select **Line Charts**.

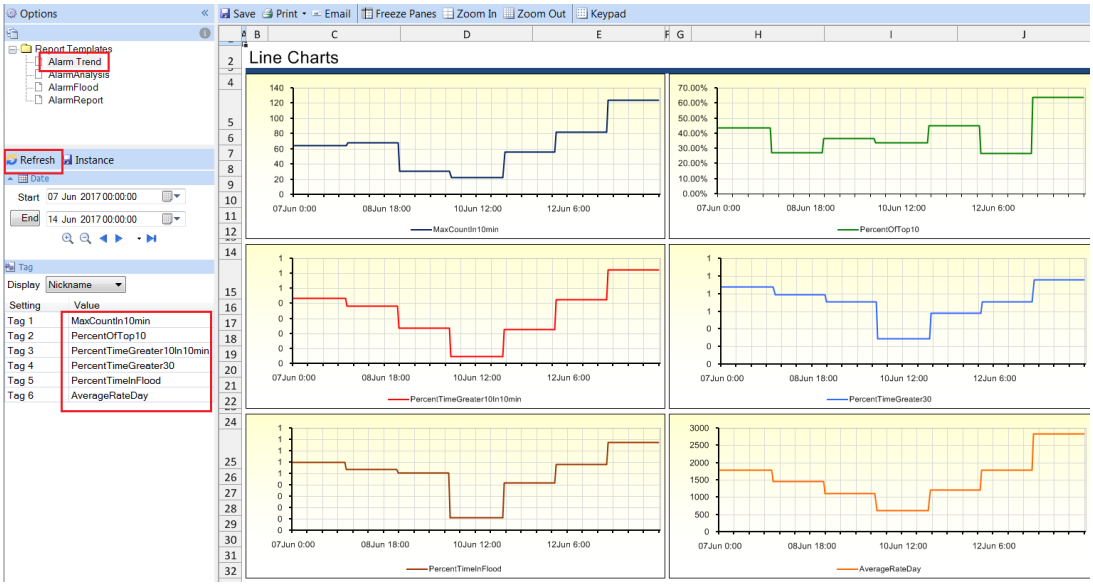


- Click **Next**

On the next step

- Set the **Name**

- Set the **Connector** to the KPI connector e.g., *Alarm KPI*.
- Click **Next**
- Click **Finish**



From the on-demand window

- Select the template you just created
- Enter a date range
- Select tags (KPIs)
- Click **Refresh**.

Custom Template

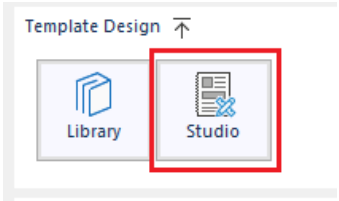
Overview

The predefined reports in the last section are created from templates. In this section, we will discuss how to create such a template and use it to produce reports, automatically and on-demand.

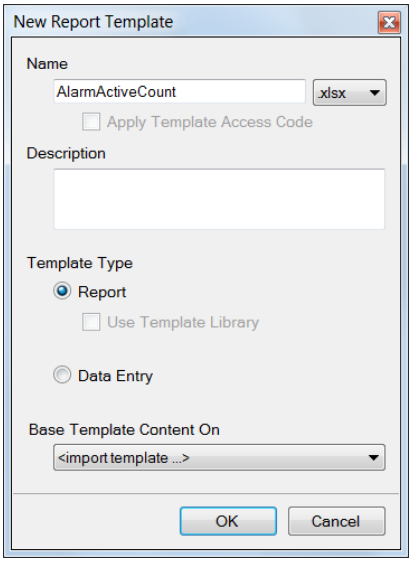
Template Studio

The Template Studio is used to create and modify templates which can be used either standalone or an add-in to Excel.

In the **Project Explorer**, from the right-side **Tools** tab in the **Template Design** select **Studio**.



From the studio, select **File, New** and enter a name for the template.

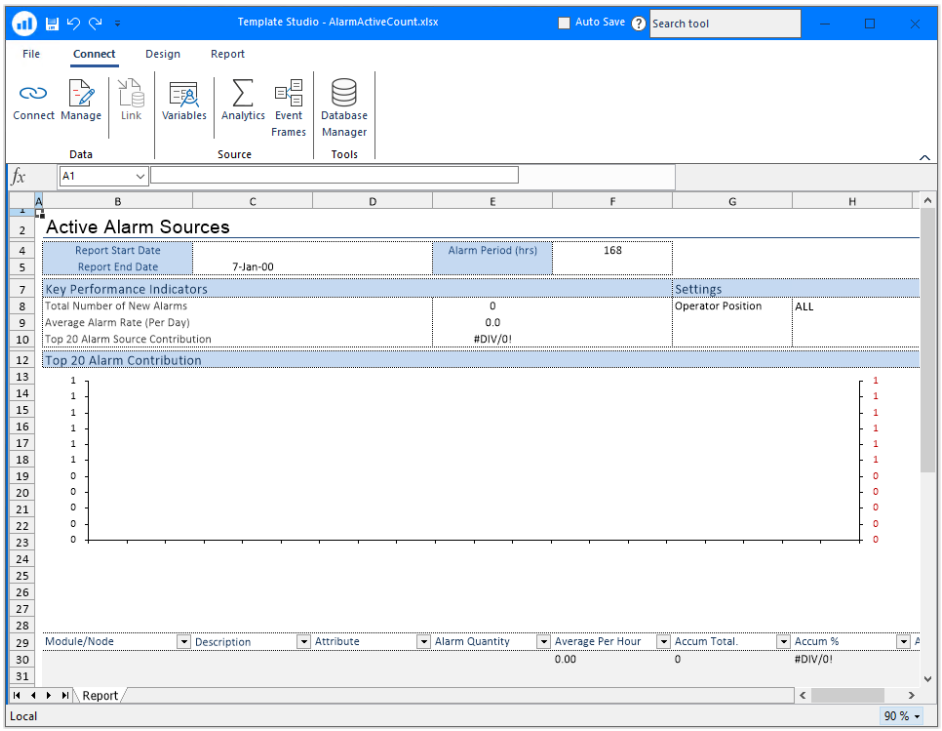


- Check **Import Existing Workbook**
- Click **OK**

In the list of pre-defined templates, select *alarm-sources.xlsx*

Layout

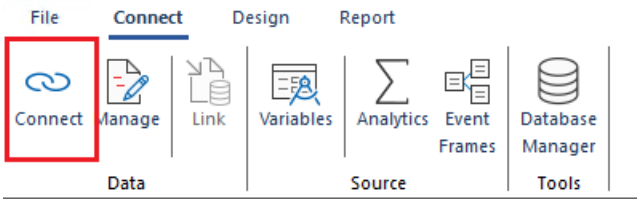
Add layout to the template such as static text and a chart.



Note that in the above example, the bar chart references rows 30 to 49. Also note that F30, G30 and H30 are formula that are evaluated from the other columns and as such, the output (see **Columns** tab below) to the template has to account for this.

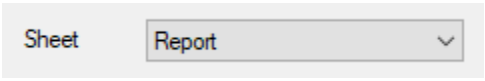
Data

Add data connections to the template that will provide the alarm data. From the **Template Studio**, under the **Connect** tab, select **Data**, **Connect**.

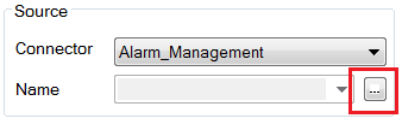


Click **Add** to add a new connection.

Set the **Sheet** to *Report* to indicate that the connection will apply to the *Report* sheet



Set the **Source Connector** to *Alarm_Management* and for **Name** click the browse pushbutton.



The dialog that is shown is used to define sub reports and where in the report their output will be placed. The display consists of two tabs, **Definition** and **Output**.

Sub Report Definition

Sub reports represent different alarm analysis. An **Instance** of a sub report is used in a report.

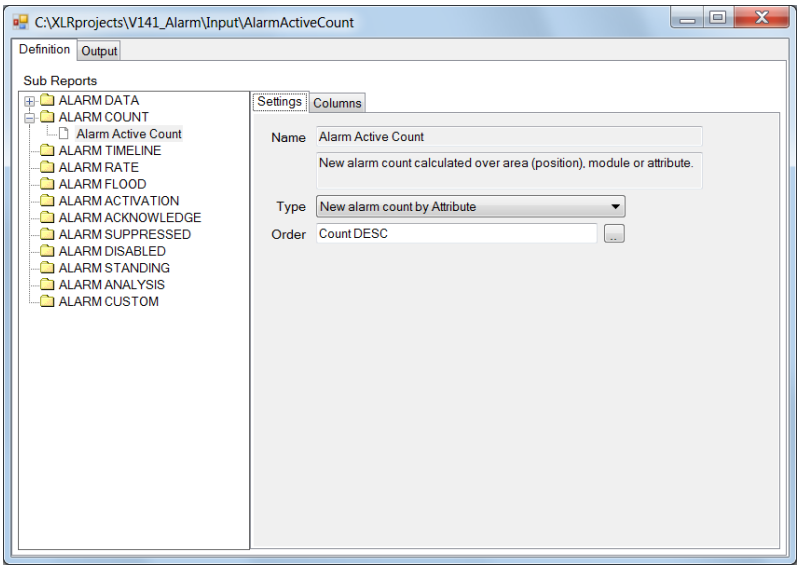
For a detailed discussion on the **Definition** and **Output** of a sub report, refer to the **Sub Report Definitions** chapter below.

To create a sub report instance, select a sub report name to populate the **Definition** and **Output** tabs with defaults. When an instance is created, it is listed under the sub report name.

In this example, a sub report to *ALARM COUNT* will be defined to provide data to the imported template.

- Select *ALARM COUNT*

Settings Tab



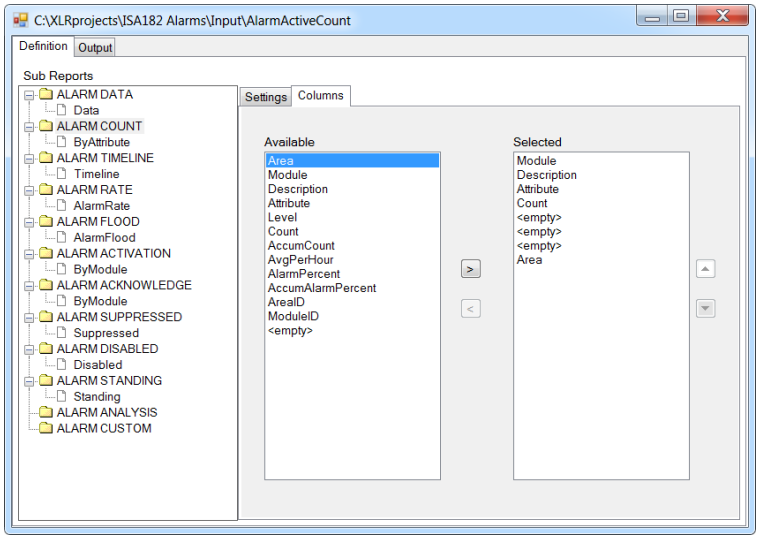
- Set the **Name** (of the instance) to *Alarm Active Count*
- Set the **Order** to *Count DESC*

Note that the **Type** determines how the count will be evaluated. The choices are by **Attribute**, **Module** or **Area**.

Note that if multiple sub report instances are assigned to a single report for each **Type**, a comprehensive view of the alarm activity can be achieved.

Columns Tab

The columns tab shows the **Available** columns for the selected sub report and the columns **Selected** for the sub report output. The selected columns are usually ordered by the design of the template layout. If any empty columns are required in the output then the <*empty*> column can be used.



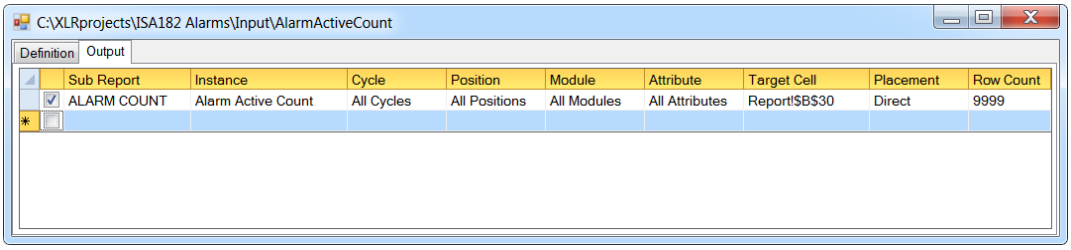
In this example, the <*empty*> selection is used to account for the formula that is in the template.

Sub report instances are automatically saved and appear as a branches on the appropriate **Sub Report**. To **Delete** a sub report instance, highlight the instance and click the **Delete** key.

Sub Report Output

The **Output** tab is used to specify the filters and cell location for the sub report output.

- Remove all the entries listed (these are defaults) by highlighting and pressing **Delete** on the keyboard.
- Highlight an empty row.



Select a sub report, in this case select *ALARM COUNT*. If there are many instances for the selected sub report, they will appear in the **Instance** dropdown list. Select the **Instance** *Alarm Active Count*

Filters

By default no filters are imposed. To impose an inclusive filter on the output, select it from the dropdown lists. Note that these lists are populated using those settings in the connector (see **Connector**).

Cycle	Filter on an alarm cycle duration
Position	Filter on operator positions which represent a group of alarms areas
Module	Filter on a set of modules
Attribute	Filter on a set of attributes

In our case leave the defaults.

Location on the Report

- **Target Cell**

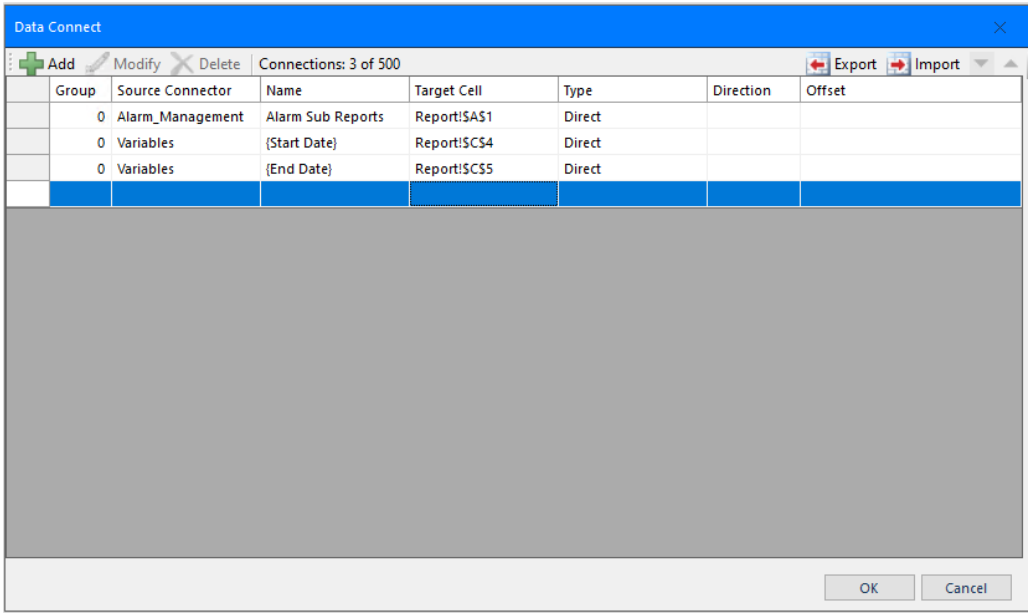
Cell location where the output is placed in the form Sheet!$A$1. The cell location can also be expressed as a **Named Range** in the form *Sheet!Name.* A named range location will change as cells are inserted above or to the left.

In our case set this to *Report!$B$30* where *Report* is the name of the sheet in the report.

- **Placement**
  The method used to place the output at the **Target Cell**.
  Direct
  Place directly at the target, overwritting any content.
  Insert
  Insert at the target cell, pushing exising content down.

- **Row Count**
  Limit on the number of rows in the output.

Close the **Alarm Designer** and return to **Connections** display.



Click **OK** to add the configutation to the grid. Note that the *Target* on this display is not used since this information was entered for each sub report.

The start and end date of the report are held in the variables *Start Date* and *End Date* which will also be configured.

- Click **Add** to add a new connection.
- Set **Sheet** to *Report*
- Set **Connector** to *Variables*
- For **Name** browse and select *Start Date*
- Set the **Target Cell** to *$C$4*
- Click **OK**

Repeat the above, setting *$C$5* to the end date variable

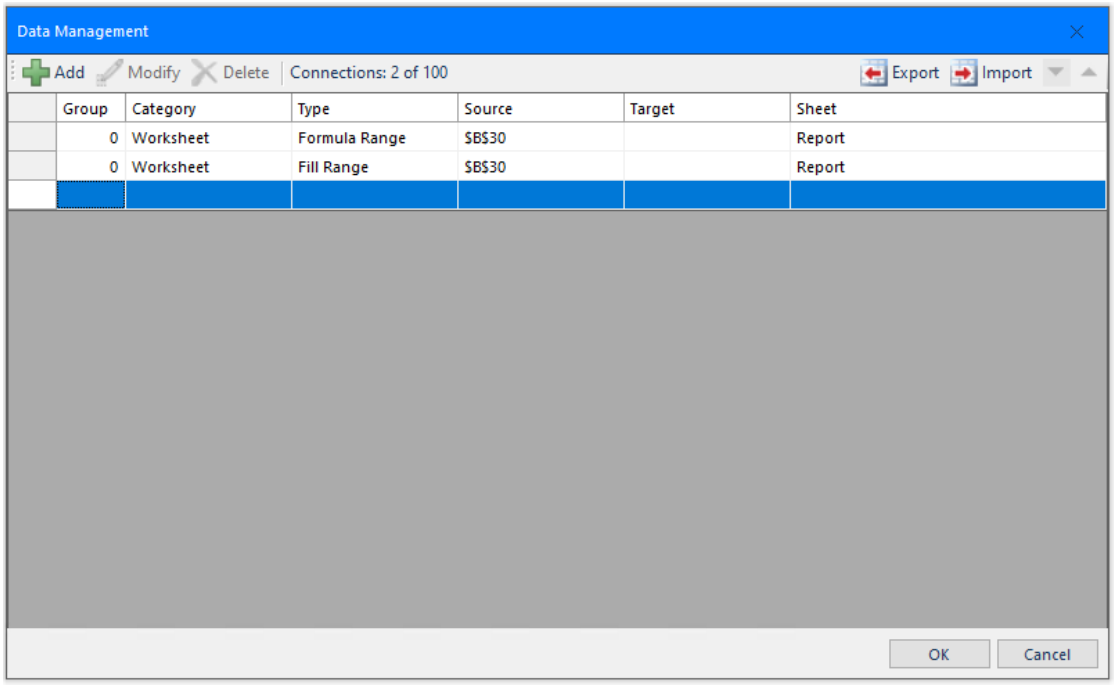
If data from other connectors, such as a historian, is added to the report then use the variables **Start Date** and **End Date** (see **Filter Variables**) to maintain the time frame across all the connections.

Clic **OK** to close **Data Connects** and return to the main display of the studio.

Manage

The formulas in cells *$F$30*, *$G$30*, and *$H$30* can be propagated down to the the extent of the alarms in the report using a **Manage** connection. This idea also applies to the formula in *$E$8* resulting in the handling of dynamic data rows.

From the ribbon, under the **Connect** tab select **Data**, **Manage**.



For the Total (E8)

- Click **Add** to add a new connection
- Set **Sheet** to *Report*
- Set **Category** to *Worksheet*
- Set **Type** to *Formula Range*
- Set **Cell** to *$B$30*

- Set **Formulas** to *$E$8*
- Click **OK**

For the Formulas (F30 to H30)

- Click **Add** to add a new connection
- Set **Sheet** to *Report*
- Set **Category** to *Worksheet*
- Set **Type** to *Fill Range*
- Set **Cell** to *$B$30*

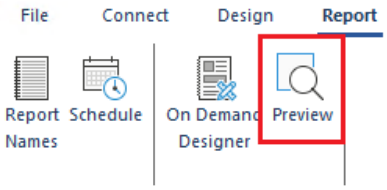
- Set **Formulas** to *$F$30: $H$30*
- Click **OK**

Click OK again to save the management connections.

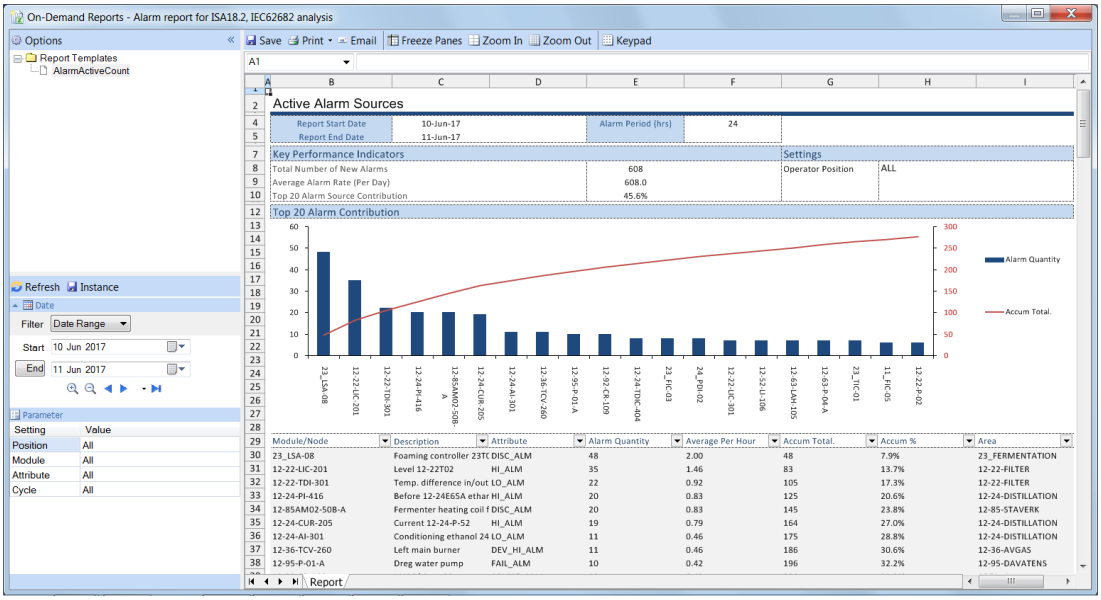
On-Demand Report

Note that for an unlicensed system, this content of this chapter will not work.

Under the **Report** tab, click **Preview**.



Set a date range and click **Refresh** to produce the report.



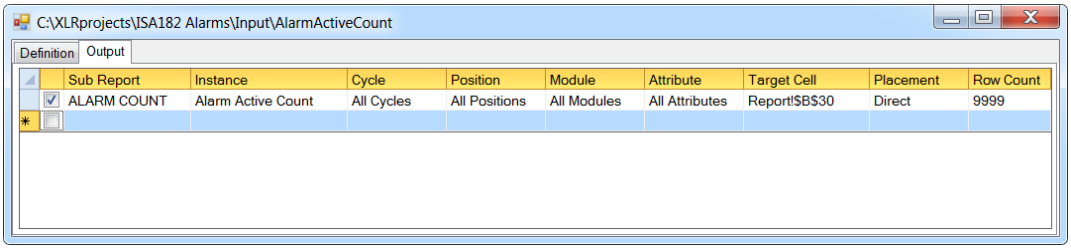
Filters Review

Overview

Filters are used to add flexibility to a report template. In the example above, a limited amount of flexibility is provided in allowing the user to select the date range.

Usage

In the previous chapter, when the *ALARM COUNT* **Sub Report** was configured on the **Output** tab, all the filters were defaulted to *All*.

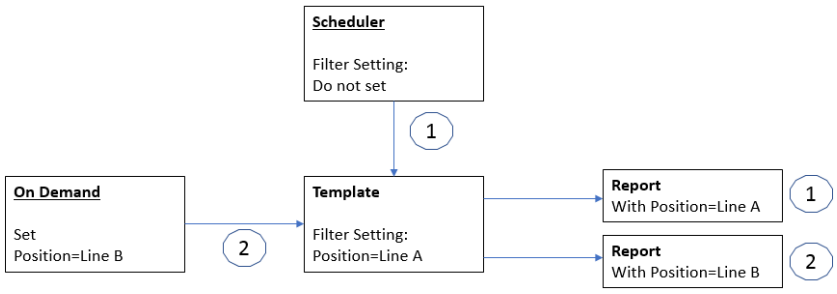


It is possible to "override" the filters at runtime by specifying a value to the underlying **Variable** representing the filter.

There are 6 variables used by all sub-reports:

Start Date The start date of the report.
End Date The end date of the report.
Cycle The cycle period. Default to *All*
Position The operator position. Default to *All*
Module A set of modules. Default to *All*
Attribute A set of attributes. Default to *All*

If any variable is given a value before the report is initiated, then the value will override the value specified in the sub report settings. This is illustrated in the following:



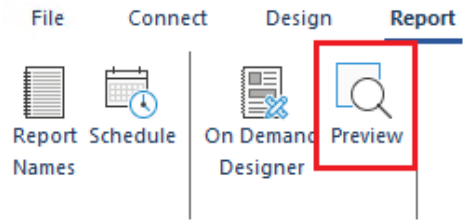
In the above example, the template has been configured with the **Position** filter set to *Line A*.

1) When the report is updated automatically from the scheduler, the variable **Position** was not altered and so the *Line A* report is produced.
2) When the template is used on-demand, the **Position** filter is set to *Line B* so the *Line B* report is produced

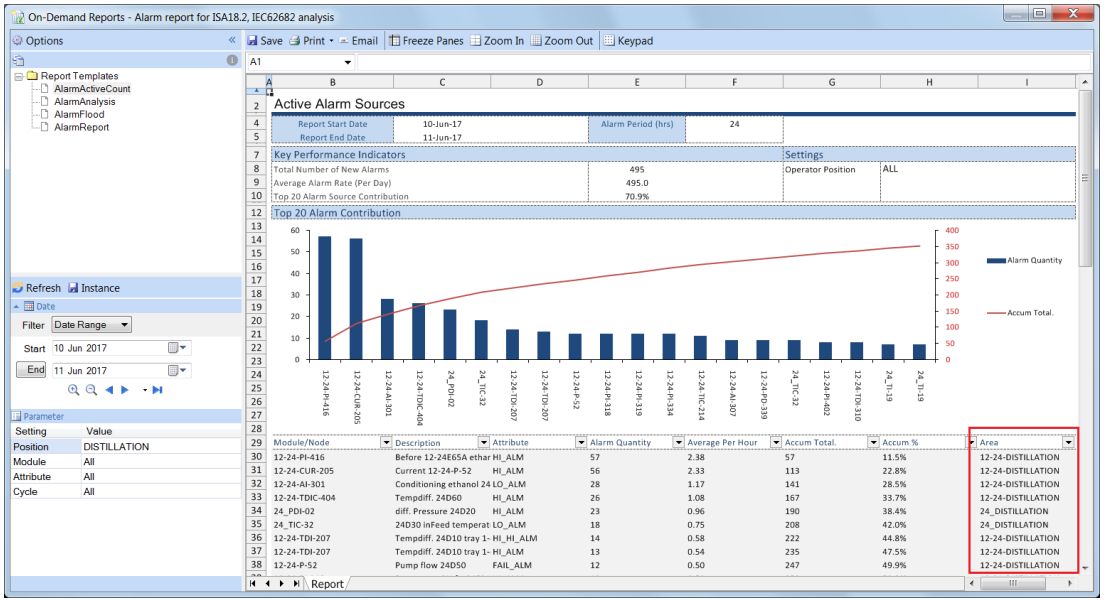
There are two methods for setting the values of variables, either on-demand using an input panel or from the scheduler using the **SET** command.

On-Demand Report

To see the Filters is action, re-open the **AlarmActiveCount** template. Click **Preview**.



Select a **Date Range**, **Position** and click **Refresh** to produce the report.



Notice the filtered areas.

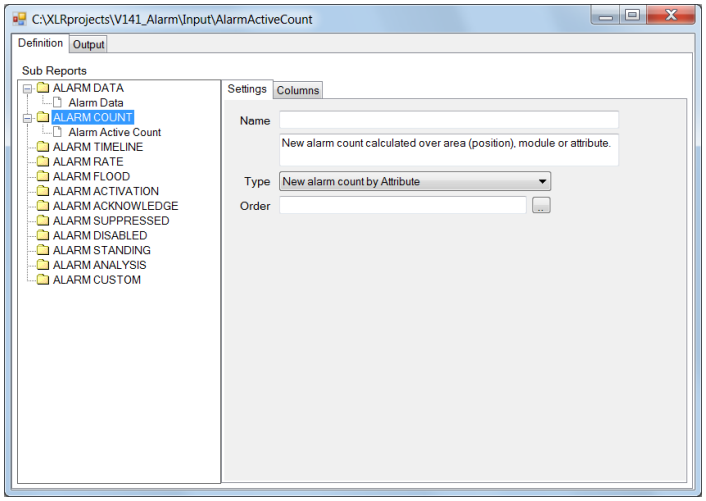
Sub Report Definitions

Overview

Sub Reports are pre-defined reports that produce output that complies with ISA18.2/IEC62682 specification. They also provide the details behind the metrics which prove to be essential in improving and rationalizing an alarm system.

Sub reports **Instances** are configured for a report. A sub report **Instance** is essentially the sub report with specific settings, columns and where its output is located in the report.

From **Data Connect** in the **Template Studio**, add a connection, select the **Alarm Management** connector and open the **Alarm Designer**.



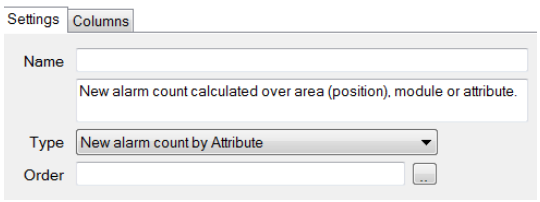
To define an **Instance**, select the sub report in the left pane, fill out the the **Settings** and **Columns** tabs. When complete, the instance will be listed in the left pane using the **Sub Report** name. To modify an instance, highlight it in the left pane.

Common Features

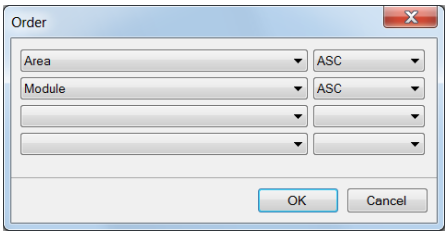
Sub reports share common features which are discussed in this section.

Settings

The following settings are common to some of the sub reports and are described here to avoid repetition.



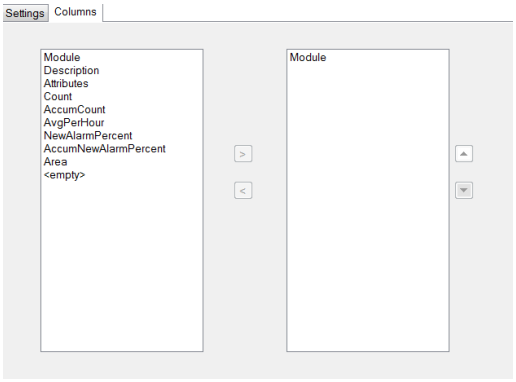
- **Name**
  The name of the sub report instance.
- **Order**
  The order of the output from the instance. Click the pushbutton […] to open the **Order** dialog.



Select a column and the ordering method. If more than one column is selected, then the ordering is performed top down e.g., in the above the *Area* is ordered first and then *Module* in each *Area*.

Columns

The **Columns** tab consists of two lists, the left list shows the *Available* columns, and the right list are the *Selected* columns. Each selected column will result as a column in the report starting from cell location **Target Cell** specified on the **Output t**ab.



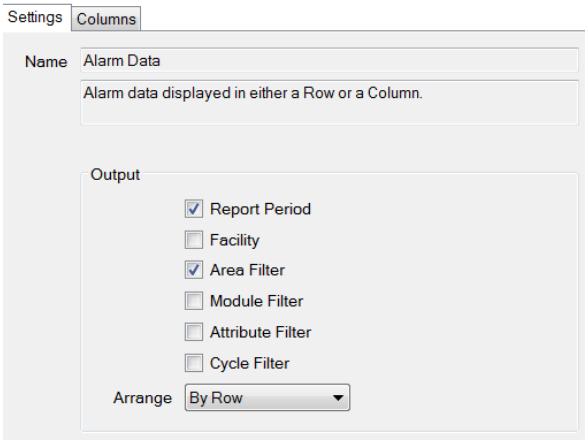
The following settings are common to some of the sub reports and are described here to avoid repetition.

- **Module**
  The module/tag name
- **Description**
  The module/tag description
- **Attribute**
  The module/tag attribute e.g., HIHI
- **Area**
  The area that the module/tag is sourced
- **Level**
  The alarm level e.g., WARNING
- **AreaID, ModuleID**
  A unique ID assigned to the area or module in the output. This ID is usually used when several instances of a sub report are in the same output and a common numeric ID between the instances is required for analysis.
- **<empty>**
  Empty column.

ALARM DATA

The **Alarm Data** sub report provides user selected data. Each item selected provides two values which are displayed by row or by column.

Settings



- **Report Period**
  The start date and end date of the report
- **Facility**
  The facility name and location defined in the data connector
- **Area, Module, Attribute, Cycle Filter**
  The filter selected for the report expressed as a name and definition.

Arrange

- **By Column**

7-Jun-2017	DISTILLATION
8-Jun-17	12-24-Distillation, 12-25-Distillation

- **By Row**

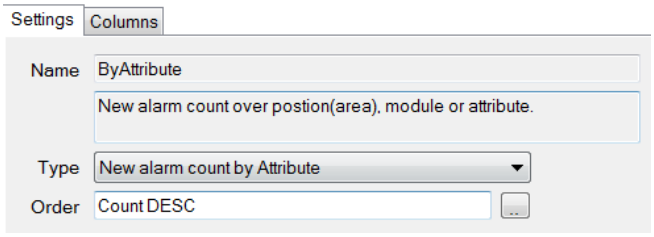
7-Jun-2017	8-Jun-2017
DISTILLATION	12-24-Distillation, 12-25-Distillation

For custom layout, output to a background sheet and use formula to place the values as required.

ALARM COUNT

The **Alarm Count** sub report provides new alarm counts over area, module and attribute.

Settings



- **Type**
  - **New alarm count by Attribute**
    The counts are calculated by module/tag attributes
  - **New alarm count by Module**
    The counts are calculated by module

- **New alarm count by Area**
  The counts are calculated by area

Columns

- **Count**
  A count of the number of new active alarms for the area, module or attribute.
- **AccumCount**
  Accumulated count of the number of new active alarms.
- **AvgPerHour**
  Count of the number of new active alarms divided by the total number of hours of the report period.
- **AlarmPercent**
  Percentage of the number of new active alarms.
- **AccumAlarmPercent**
  Accumulated percentage of the number of new active alarms.

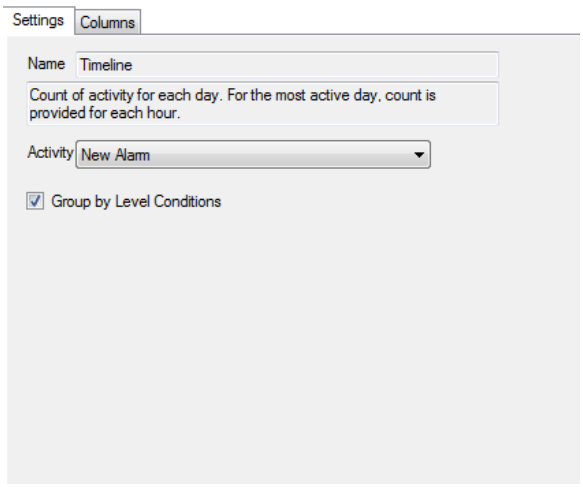
Output

Module/Node	Description	Attributes	Alarm Quantity	Average Per Hour	Accum Total.	Accum %	Area
12-92-CR-109	HVAC/ Area 22	ADVISE_ALM	215	8.96	215	12.5%	AREA_A
12-31-PDI-906	Filter guard 12-31G09	HI_ALM	191	7.96	406	23.6%	12-31-REFINING
23_LSA-08	Foaming controller 23T03	DISC_ALM	97	4.04	503	29.2%	23_FERMENTATION
12-22-TIC-301	Mash temperature 22E04	PVBAD_ALM	76	3.17	579	33.6%	12-22-FILTER
12-21-XS-108	Activate 12-21Q12B	FAIL_ALM	63	2.63	642	37.3%	12-21-MALT
12-21-XS-106	Activate 12-21Q12A	FAIL_ALM	62	2.58	704	40.9%	12-21-MALT
12-95-XS-102	Aumadon dike	FAIL_ALM	27	1.13	731	42.5%	12-95-DAGVATTENS
SEQ-12-95-P01	Control Module	LARM_1295P01A_B	14	0.58	745	43.3%	12-95-DAGVATTENS
23_FIC-03	mash Feed till 23T01	DV_LO_ALM	14	0.58	759	44.1%	23_FERMENTATION
12-24-TDI-207	Tempdiff. 24D10 tray 1-4	HI_HI_ALM	13	0.54	772	44.9%	12-24-DISTILLATION
12-22-P-02	Discharge pump 12-22T02	FAIL_ALM	12	0.50	784	45.6%	12-22-FILTER
22_AIC-03	Mash linens pH reg.	LO_ALM	12	0.50	796	46.3%	22_STARCH
12-22-LAH-302	Liquid Level 12-22T03	DISC_ALM	11	0.46	807	46.9%	12-22-FILTER
12-22-XS-307	Mash on/off 22E03	FAIL_ALM	11	0.46	818	47.5%	12-22-FILTER
12-24-AI-301	Conditioning ethanol 24P71	LO_ALM	11	0.46	829	48.2%	12-24-DISTILLATION
12-24-PI-416	Before 12-24E65A ethanol	HI_ALM	11	0.46	840	48.8%	12-24-DISTILLATION
32_TI-30	Kyldiff pellet cooler	HI_HI_ALM	11	0.46	851	49.4%	32_DRYING
12-23-PIC-804	Pressure regulator 23P14	HI_ALM	10	0.42	861	50.0%	12-23-FERMENT
21_J11BM1	Silo transporter	FAIL_ALM	10	0.42	871	50.6%	21_MILLING

ALARM TIMELINE

The **Alarm Timeline** sub report provides a count of daily alarm activity and also for each hour of the most active day.

Settings



- **Activity**
  Indicates the type of activity for the timelines. Choices are:
  - New Alarm
  - Suppressed Alarm
  - Disabled Alarm
  - High Alarm
  - Low Alarm

  Custom activity can also be specified.

- **Group by Level Conditions**

  If unchecked, the timeline calculation will be for all levels combined.

  To produce timelines for specific levels, uncheck this setting and specify the level conditions in the **Connector Settings**, one row for each condition.

Output

For each day:

Total by Day	CRITICAL	WARNING	ADVISORY	INFO
6/9/2017	38	427	659	0
6/10/2017	40	247	451	0
6/11/2017	78	470	453	0
6/12/2017	284	1062	528	0
6/13/2017	68	433	1991	0
6/14/2017	106	528	4621	0
6/15/2017	128	554	2574	2

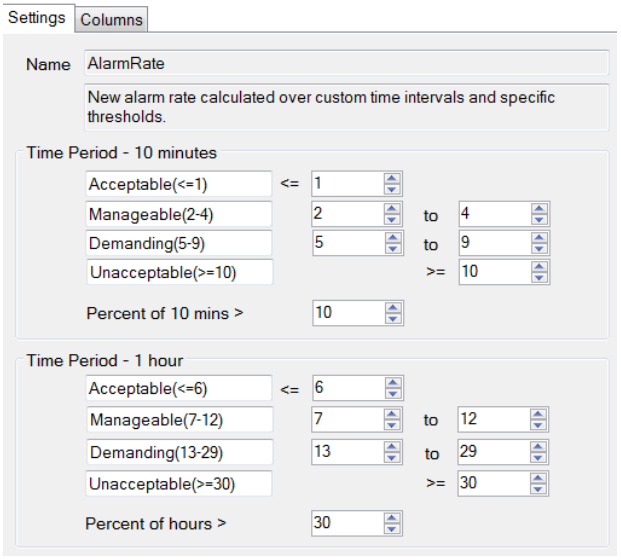
For the most active day, calculated by hour:

Total by Hour	CRITICAL	WARNING	ADVISORY	INFO
6/14/2017	7	13	112	0
6/14/2017 1:00	1	3	115	0
6/14/2017 2:00	5	26	70	0
6/14/2017 3:00	7	47	160	0
6/14/2017 4:00	7	24	152	0
6/14/2017 5:00	8	10	236	0
6/14/2017 6:00	2	32	179	0
6/14/2017 7:00	4	38	204	0
6/14/2017 8:00	6	25	229	0
6/14/2017 9:00	9	19	295	0
6/14/2017 10:00	4	13	256	0
6/14/2017 11:00	9	26	274	0
6/14/2017 12:00	6	10	309	0
6/14/2017 13:00	3	25	266	0
6/14/2017 14:00	4	51	323	0
6/14/2017 15:00	5	37	358	0
6/14/2017 16:00	4	16	266	0
6/14/2017 17:00	1	6	467	0
6/14/2017 18:00	1	6	166	0
6/14/2017 19:00	3	18	14	0
6/14/2017 20:00	0	33	58	0
6/14/2017 21:00	0	12	26	0
6/14/2017 22:00	3	19	43	0
6/14/2017 23:00	7	19	43	0

ALARM RATE

The **Alarm Rate** sub report calculates the new alarm counts over two custom alarm periods: **10 minutes** and **1 hour**. It expresses the output in four threshold groups, each with a configurable label and count interval.

Settings



- **Thresholds**

  For each time period, four thresholds are specified. Each threshold consists of a textual label, a low limit and a high limit.

  For each period, a count of the alarms is calculated and compared to the low/high limits to determine which threshold to increment.

- **Percent**

  Indicates the percentage of time exceeding the specified count.

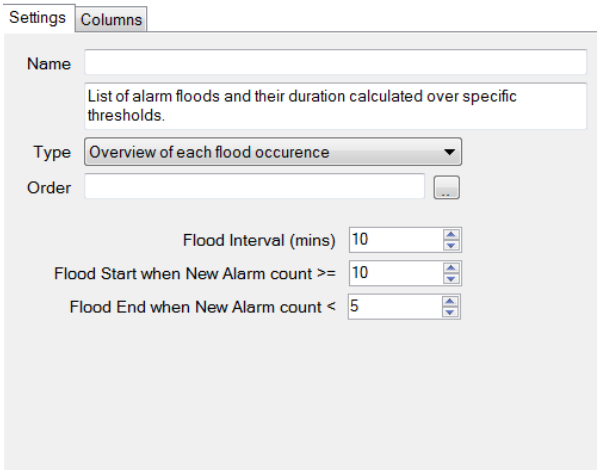
Output

per 10 min				per hour					
Name	low	high	count		low	high	count		
Acceptable(<1)		1	443	Acceptable(<6)		6	22	Peak	130
Demanding(5-9)	2	4	936	Demanding(13-29)	7	12	22	Peak Time	6/14/2017 17:30
Manageable(2-4)	5	9	1376	Manageable(7-12)	13	29	164	Percent of hours > 30	0.686781609
Unacceptable(>=10)	10		1421	Unacceptable(>=30)	30		488	Percent of 10 mins > 10	0.301963602

In the example, there were *443* **10 minute** periods during which *1* or less alarms occurred. On the other hand, there were *1421* **10 minute** periods where more than *10* alarms occurred (which by definition is the beginning of an alarm flood).

ALARM FLOOD

The **Alarm Flood** sub report provides a list of all the occurrences of alarm floods. An alarm flood is configured with a start condition and end condition. Usually, the start condition is more than 10 new alarms in 10 minutes and the end condition is less than 5 new alarms in 10 minutes.



- **Type**
  - **Overview of each alarm flood**

    Overview of each flood occurrence showing start/end times and the total alarms that occurred.
  - **Details of the alarms in each flood**

    The details of the alarms in the flood. Note that the **FloodID** can be used to associate the details to the overview.
  - **Metrics of the alarms in each flood**

    Count of each alarm in the flood. Note that the **FloodID** can be used to associate the details to the overview.
- **Flood Interval (mins)**

  The time interval used by the flood start/end settings.
- **Flood Start when New Alarm count >=**

  Start of flood definition calculated over the flood interval.
- **Flood End when New Alarm count <**

  End of flood definition calculated over the flood interval.

Columns

- **StartDate**
  Start date of a flood.
- **EndDate**
  End date of a flood.
- **Duration**
  Duration of the flood (in days).
- **Start Peak**
  Time of the highest number of alarms during the flood interval.
- **Peak**
  Number of alarms during the peak flood interval.
- **Total**
  Total number of new alarms.
- **FloodID**
  A unique ID for each flood.

Output

Overview of each alarm flood:

Start	End	Duration (mins)	Peak Start	Peak Count	Alarm Total
6/7/2017 2:10	6/7/2017 2:40	30	6/7/2017 2:10	18	31
6/7/2017 4:20	6/7/2017 4:50	30	6/7/2017 4:30	23	44
6/7/2017 5:00	6/7/2017 7:50	170	6/7/2017 6:50	39	306
6/7/2017 8:30	6/7/2017 9:00	30	6/7/2017 8:30	25	47
6/7/2017 9:20	6/7/2017 14:20	300	6/7/2017 9:40	64	590
6/7/2017 14:40	6/7/2017 15:50	70	6/7/2017 15:10	36	150
6/7/2017 17:00	6/7/2017 18:10	70	6/7/2017 17:20	16	81
6/7/2017 18:40	6/7/2017 19:10	30	6/7/2017 18:40	21	38
6/7/2017 21:50	6/7/2017 22:20	30	6/7/2017 21:50	21	37
6/7/2017 22:30	6/7/2017 23:40	70	6/7/2017 22:50	50	192

Details of the alarms in each flood:

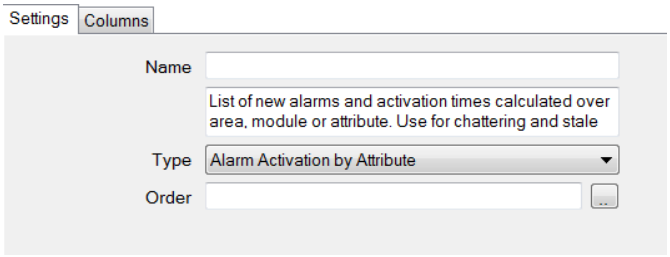
Start	Module	Description	Attribute	Level	Area	FloodID
6/7/2017 2:11	12-95-LAH-106	LiquidLevel 12-95P03	DISC_ALM	07-ADVISORY	12-95-DAGVATTENS	1
6/7/2017 2:14	23_FIC-03	mash Feed till 23T01	DV_LO_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:14	22_HS-01	sulfuric acid mixer 22A04	FAIL_ALM	11-WARNING	22_STARCH	1
6/7/2017 2:15	63_LIC-05	Level regulator collection pit	HI_ALM	11-WARNING	63_WASTEWATER	1
6/7/2017 2:15	12-24-PD-337	Delta press. 12-24E32B	HI_ALM	07-ADVISORY	12-24-DISTILLATION	1
6/7/2017 2:15	23_FIC-05	mash Feed till 23T02	DV_LO_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:16	23_LSA-08	Foaming controller 23T03	DISC_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:17	23_FIC-03	mash Feed till 23T01	DV_HI_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:17	51_FIC-10	23T01 Flows reg.	DV_LO_ALM	11-WARNING	51_CHEMICALS	1
6/7/2017 2:17	22_AIC-03	Mash linens pH reg.	DV_HI_ALM	07-ADVISORY	22_STARCH	1
6/7/2017 2:17	22_AIC-03	Mash linens pH reg.	HI_ALM	11-WARNING	22_STARCH	1
6/7/2017 2:17	22_TIC-07	mash till fermentation temp	DV_HI_ALM	11-WARNING	22_STARCH	1
6/7/2017 2:18	22_TIC-07	mash till fermentation temp	HI_ALM	11-WARNING	22_STARCH	1
6/7/2017 2:18	22_TIC-07	mash till fermentation temp	HI_HI_ALM	15-CRITICAL	22_STARCH	1
6/7/2017 2:18	22_AIC-03	Mash linens pH reg.	HI_HI_ALM	15-CRITICAL	22_STARCH	1
6/7/2017 2:18	23_FIC-03	mash Feed till 23T01	DV_LO_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:18	23_FIC-03	mash Feed till 23T01	DV_HI_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:19	23_FIC-03	mash Feed till 23T01	DV_LO_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:20	22_AIC-03	Mash linens pH reg.	HI_ALM	11-WARNING	22_STARCH	1
6/7/2017 2:21	23_FIC-03	mash Feed till 23T01	DV_LO_ALM	11-WARNING	23_FERMENTATION	1
6/7/2017 2:21	22_AIC-03	Mash linens pH reg.	HI_HI_ALM	15-CRITICAL	22_STARCH	1

Metrics of the alarms in each flood:

Module	Attribute	Total	Area	FloodID
11_LIA-28	HI_ALM	1	11_GRAINSILO	1
11_LIA-28	HI_HI_ALM	1	11_GRAINSILO	1
12-22-AIC-401	DV_HI_ALM	1	12-22-FILTER	1
12-22-AIC-401	DV_LO_ALM	1	12-22-FILTER	1
12-23-XS-110	FAIL_ALM	1	12-23-FERMENT	1
SEQ-12-23-FERM	23T05_PROV	1	12-23-FERMENT	1
SEQ-12-23-FERM	FERMENTOR_KLAR	1	12-23-FERMENT	1
12-24-PD-337	HI_ALM	1	12-24-DISTILLATION	1
12-24-TIC-214	DV_LO_ALM	1	12-24-DISTILLATION	1
12-51-P-38	FAIL_ALM	1	12-51-KLAGER	1
12-95-LAH-106	DISC_ALM	1	12-95-DAGVATTENS	1
22_AIC-03	DV_HI_ALM	1	22_STARCH	1
22_AIC-03	HI_ALM	2	22_STARCH	1
22_AIC-03	HI_HI_ALM	2	22_STARCH	1
22_HS-01	FAIL_ALM	1	22_STARCH	1
22_TIC-07	DV_HI_ALM	1	22_STARCH	1
22_TIC-07	HI_ALM	1	22_STARCH	1
22_TIC-07	HI_HI_ALM	1	22_STARCH	1
23_FIC-03	DV_HI_ALM	2	23_FERMENTATION	1
23_FIC-03	DV_LO_ALM	4	23_FERMENTATION	1
23_FIC-05	DV_LO_ALM	1	23_FERMENTATION	1
23_LSA-08	DISC_ALM	2	23_FERMENTATION	1

ALARM ACTIVATION

The **Alarm Activation** sub report provides the alarm activation times over area, module and attribute. Alarm activation time is defined as the time from when an alarm is active to when it is inactive. This sub report is used to determine chattering and stale alarms.



Settings

- **Type**
  - **Alarm Activation by Attribute**
    The alarm activation times are calculated by attributes.
  - **Alarm Activation by Module**
    The alarm activation times are calculated by module.
  - **Alarm Activation by Area**
    The alarm activation times are calculated by area.

Columns

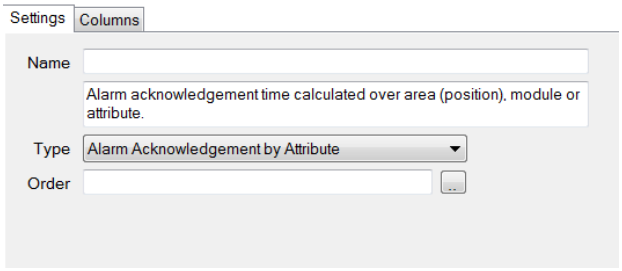
- **Count**
  Number of cycles
- **Average**
  Average amount of time (in days)
- **Total**
  Total amount of time (in days)
- **Peak**
  Longest time (in days)

Output

Module/Node	Description	Time Active	Average Time	Total Time	Peak	Area
12-63-P-02-A	Fermenter waste pump	1	0.12:59:27	0:12:59:27	0:12:59:27	12-63-SVAT
32_SS-05	32J03B rotation valve	1	0.07:21:23	0:07:21:23	0:07:21:23	32_DRYING
23_LIA-01	23T07 yeast liquid level sensor	3	0.07:09:12	0:21:27:35	0:11:02:17	23_FERMENTATION
24_TIC-32	24D30 inFeed temperatur Pt-100	2	0.06:45:59	0:13:31:59	0:13:26:34	24_DISTILLATION
31_DIC-50	Flows Density	2	0.06:26:52	0:12:53:44	0:09:58:52	31_STILLAGE
32_AIC-03	O2 Mätning 32E01B	2	0.06:17:22	0:12:34:45	0:06:18:55	32_DRYING
31_FIC-04	Flow till 31S01B	1	0.05:44:33	0:05:44:33	0:05:44:33	31_STILLAGE
31_FIC-26	Saturation water till 31P61A	1	0.05:39:09	0:05:39:09	0:05:39:09	31_STILLAGE
12-24-PD-337	Delta press. 12-24E32B	2	0.05:38:41	0:11:17:23	0:08:17:08	12-24-DISTILLATION
32_TIA-70	Temperature 32S01A	2	0.05:38:24	0:11:16:48	0:05:41:59	31_STILLAGE
31_EI-03	decanter 2	1	0.05:32:39	0:05:32:39	0:05:32:39	31_STILLAGE
12-66-TIC-101	Saturated Steam t. 12-66T01	1	0.05:31:05	0:05:31:05	0:05:31:05	12-66-PROCESSVAT
31_P01M1_CTR	speed 31P01M1	1	0.05:24:46	0:05:24:46	0:05:24:46	31_STILLAGE
12-31-LI-754	Level 12-31T50	2	0.05:22:35	0:10:45:10	0:05:22:35	12-31-REFINING
12-32-GA-403	Door 12-32E23A	1	0.05:08:31	0:05:08:31	0:05:08:31	12-32-TRANSPORTER
32_J54M1	Silo elevator	1	0.04:43:13	0:04:43:13	0:04:43:13	32_DRYING
32_J56M1	Silo elevator	1	0.04:40:11	0:04:40:11	0:04:40:11	32_DRYING
32_S52M1	PELLETTerm	1	0.04:40:03	0:04:40:03	0:04:40:03	32_DRYING
32_S52M2	PELLETTerm	1	0.04:39:59	0:04:39:59	0:04:39:59	32_DRYING

ALARM ACKNOWLEDGE

The **Alarm Acknowledge** sub report provides the alarm acknowledgement times over area, module and attribute. Alarm acknowledgement time is defined as the time period of the transition from an unacknowledged to acknowledged state.



Settings

- **Type**
  - **Alarm Acknowledgement by Attribute**
    The alarm acknowledgement times are calculated by attributes.
  - **Alarm Acknowledgement by Module**
    The alarm acknowledgement times are calculated by module.
  - **Alarm Acknowledgement by Area**
    The alarm acknowledgement times are calculated by area.

Columns

- **Count**
  Number of cycles
- **Average**
  Average amount of time (in days)
- **Total**
  Total amount of time (in days)
- **Peak**
  Longest time (in days)

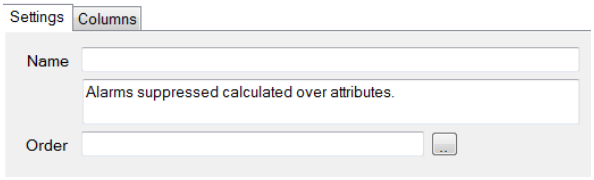
Output

Module/Node	Description	Time Active	Average Time	Total Time	Peak	Area
65_PI-14	Pressure Before ejector	2	0.035474537	0:01:42:10	0:01:07:30	65_STEAM
12-32-GA-401-B	Band time guard 12-32J26	1	0.021273148	0:00:30:38	0:00:30:38	12-32-TRANSPORTER
23_LIC-07	Level reg. 23T03 level sens	1	0.016770833	0:00:24:09	0:00:24:09	23_FERMENTATION
LARM_DEPÅ	Alarm depot	2	0.014722222	0:00:42:24	0:00:21:12	12-27-ETANOLLAGE
21_EIC-01	Feed controller 21G11A	2	0.014502315	0:00:41:46	0:00:37:44	21_MILLING
63_LIC-05	Level regulator collection p	7	0.013883929	0:02:19:57	0:01:40:15	63_WASTEWATER
65_TI-14	Condensation return temp	2	0.011400463	0:00:32:50	0:00:27:20	65_STEAM
12-92-CR-109	HVAC/ Area 22	2	0.011383102	0:00:32:47	0:00:25:21	AREA_A
12-23-PIC-804	Pressure regulator 23P14	8	0.011157407	0:02:08:32	0:00:58:55	12-23-FERMENT
22_FIC-06	Finished Flow till 22T01	1	0.010694444	0:00:15:24	0:00:15:24	22_STARCH
12-63-LAH-108	Pump i kemhus	1	0.009039352	0:00:13:01	0:00:13:01	12-63-SVAT
31_LIA-03	31T03 level sensor	2	0.008883102	0:00:25:35	0:00:23:40	31_STILLAGE
23_LSA-06	Foaming controller 23T02	1	0.008275463	0:00:11:55	0:00:11:55	23_FERMENTATION
51_FIC-16	Caustic Flow till 24D50	8	0.008266782	0:01:35:14	0:01:21:15	51_CHEMICALS
21_LS-08	21T02 Level	1	0.005648148	0:00:08:08	0:00:08:08	21_MILLING
12-51-FIC-209	Flowsregl. NaOH t. 24T08	4	0.00556713	0:00:32:04	0:00:25:26	12-51-KLAGER
12-32-GA-401-A	Band time guard 12-32J26	5	0.005168981	0:00:37:13	0:00:13:43	12-32-TRANSPORTER
11_LIA-28	12-11T28 level sensor	14	0.005123181	0:01:43:17	0:00:21:47	11_GRAINSILO
12-11-GA-111	Imbalance 12-11S24A	1	0.005104167	0:00:07:21	0:00:07:21	12-11-SP
65_PI-06	Pressure till 65T01	2	0.005005787	0:00:14:25	0:00:10:45	65_STEAM
12-24-TDI-207	Tempdiff. 24D10 tray 1-4	15	0.004862654	0:01:45:02	0:00:23:28	12-24-DISTILLATION
12-32-GA-401-G	Band time guard 12-32J26	6	0.00480517	0:00:41:31	0:00:23:33	12-32-TRANSPORTER
32_G51A	Pellet press interlocks	5	0.004622685	0:00:33:17	0:00:16:17	32_DRYING

ALARM SUPPRESSED

The **Alarm Suppressed** sub report provides the alarms suppressed during the report period.

Settings



Columns

- **Count**
  Number of times the alarm was suppressed during the report period
- **Average**
  Average amount of time the alarm was suppressed during the report period (in days)
- **Total**
  Total amount of time the alarm was suppressed during the report period (in days)
- **AtClose**
  Marker to show that the alarm remained suppressed at the end of the report period

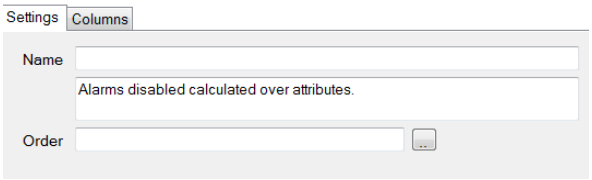
Output

Module/Node	Description	Attribute	Count	Average Time	Total Time	Alarm Area
22_TIC-07	mash till fermentation t	HI_ALM	8	0.01:16:45	0.10:14:02	22_STARCH
22_TIC-07	mash till fermentation t	HI_HI_ALM	8	0.01:16:45	0.10:14:02	22_STARCH

ALARM DISABLED

The **Alarm Disabled** sub report provides the alarms disabled during the report period.

Settings



Columns

- **Count**
  Number of times the alarm was disabled during the report period
- **Average**
  Average amount of time the alarm was disabled during the report period (in days)
- **Total**
  Total amount of time the alarm was disabled during the report period (in days)
- **AtClose**
  Marker to show the alarm remained suppressed at the end of the report period

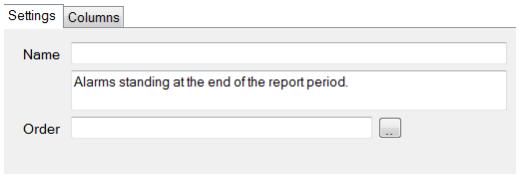
Output

	Module/Node	Description	Attribute	Count	Average Time	Total Time	Alarm Area
x	11_LIA-25	12-11T25 level sensor	HI_ALM	1	0:07:26:41	0:07:26:41	11_GRAINSILO
x	11_LIA-25	12-11T25 level sensor	HI_HI_ALM	1	0:07:26:41	0:07:26:41	11_GRAINSILO
x	62_X-02	Alarm 62PV21/22 open	DISC_ALM	4	0:04:59:58	0:19:59:55	62_COOLINGWATER
	12-24-AI-301	Conditioning ethanol 24P71	HI_ALM	1	0:02:42:47	0:02:42:47	12-24-DISTILLATION
	12-24-TI-412	Temp alcohol to RK1	LO_ALM	1	0:02:35:54	0:02:35:54	12-24-DISTILLATION
	12-24-TDIC-329	Tempdiff. 24D70	HI_ALM	1	0:01:20:54	0:01:20:54	12-24-DISTILLATION
	12-24-TDIC-404	Tempdiff. 24D60	HI_ALM	1	0:01:20:54	0:01:20:54	12-24-DISTILLATION
	12-24-TDIC-404	Tempdiff. 24D60	LO_ALM	1	0:01:20:54	0:01:20:54	12-24-DISTILLATION
	12-24-TDI-207	Tempdiff. 24D10 tray 1-4	HI_ALM	1	0:01:20:53	0:01:20:53	12-24-DISTILLATION
	12-24-TDI-307	Tempdiff. bottom 1-4 24D30	HI_ALM	1	0:00:45:54	0:00:45:54	12-24-DISTILLATION
	12-24-TDI-310	Tempdiff. 24D30/D70	LO_ALM	1	0:00:45:54	0:00:45:54	12-24-DISTILLATION
	12-24-PIC-218	Pressure regulator t. 24P03	HI_ALM	1	0:00:45:53	0:00:45:53	12-24-DISTILLATION
	12-24-TDIC-329	Tempdiff. 24D70	LO_ALM	1	0:00:35:55	0:00:35:55	12-24-DISTILLATION
	12-24-TIC-214	Temp bladder	DV_HI_ALM	1	0:00:35:53	0:00:35:53	12-24-DISTILLATION
	12-24-TIC-214	Temp bladder	DV_LO_ALM	1	0:00:35:53	0:00:35:53	12-24-DISTILLATION
x	11_LIA-26	12-11T26 level sensor	HI_ALM	1	0:00:24:16	0:00:24:16	11_GRAINSILO
x	11_LIA-26	12-11T26 level sensor	HI_HI_ALM	1	0:00:24:16	0:00:24:16	11_GRAINSILO
x	23_LSA-08	Foaming controller 23T03	DISC_ALM	97	0:00:10:56	0:17:41:23	23_FERMENTATION
	32_GS-10A	Emergency dryer	DISC_ALM	8	0:00:03:22	0:00:27:01	32_DRYING

ALARM STANDING

The **Alarm Standing** sub report provides the alarms standing at the end of the report period. Standing alarms are new alarms that remain active at the end of the report period.

Settings



Columns

- **FirstDate**
  First time the alarm became active but did not return back to normal
- **LastDate**
  Last time the alarm state changed (except inactive) before the end of the report period
- **State**
  Last state of the alarm at the end of the report period

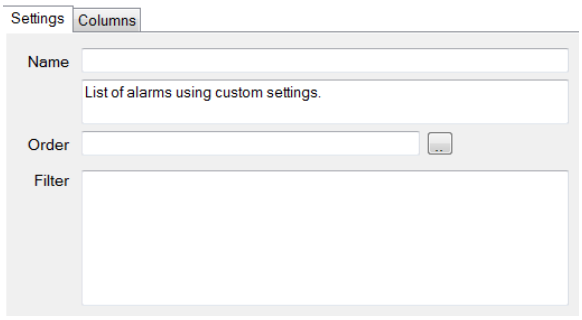
Output

Module	Description	First Date	Last Date	State
11_LIA-28	12-11T28 level sensor	6/7/17 15:35	6/7/17 15:43	ACT/ACK
11_LIA-28	12-11T28 level sensor	6/7/17 15:35	6/7/17 15:43	ACT/ACK
11_LIA-28	12-11T28 level sensor	6/7/17 15:25	6/7/17 15:25	ACT/ACK
12-21-LAH-305	Liquid Level 12-21Q35	6/7/17 23:13	6/7/17 23:14	ACT/ACK
12-22_VVX_CIP	CIP Alarm VVX	6/7/17 21:29	6/7/17 21:29	ACT/ACK
12-22-TDI-301	Temp. difference in/out	6/7/17 11:36	6/7/17 11:38	ACT/ACK
12-22-TIC-101	Temp. regulator 22T01	6/7/17 19:46	6/7/17 19:50	ACT/ACK
12-22-TIC-301	Mash temperature 22E(	6/7/17 23:52	6/7/17 23:52	ACT/UNACK
12-24-AI-301	Conditioning ethanol 24	6/7/17 23:36	6/7/17 23:49	ACT/ACK
12-24-FIC-102	Mash flow regulator 24I	6/7/17 13:53	6/7/17 13:53	ACT/ACK
12-24-LIC-305	Level regulator 24D30/7	6/7/17 23:58	6/7/17 23:58	ACT/UNACK
12-24-PD-337	Delta press. 12-24E32B	6/7/17 14:31	6/7/17 14:31	ACT/ACK
12-24-PI-334	Pressure after 12-24P21	6/7/17 14:03	6/7/17 14:03	ACT/ACK
12-24-PI-416	Before 12-24E65A ethar	6/7/17 22:38	6/7/17 22:39	ACT/ACK
LARM_DEPÅ	Alarm depot	6/7/17 9:43	6/7/17 10:04	ACT/ACK
LARM_DEPÅ	Alarm depot	6/7/17 9:43	6/7/17 10:04	ACT/ACK
12-31-LI-754	Level 12-31T50	6/7/17 22:31	6/7/17 22:32	ACT/ACK
12-31-LI-754	Level 12-31T50	6/7/17 22:31	6/7/17 22:32	ACT/ACK
12-32-E-23-A-M3	Cell feeder pellet cooler	6/7/17 4:32	6/7/17 4:32	ACT/ACK
12-62-TIC-204	Temp.reg Water	6/7/17 10:44	6/7/17 10:44	ACT/ACK
12-63-FIC-201	Flows reg. till scrolling ta	6/7/17 23:58	6/7/17 23:58	ACT/UNACK
12-63-P-02-A	Fermenter waste pump	6/7/17 20:58	6/7/17 20:58	ACT/ACK

ALARM CUSTOM

The **Alarm Custom** sub report provides a custom output based on a specified set of columns and filters.

Settings



- **Filter**
  Filter is a valid *SQL WHERE* clause. Note that custom variables can be used as part of the clause. For example, using the filter *Level = {LevelSetting}* introduces a custom variable which can be set from either on-demand or from the Scheduler.

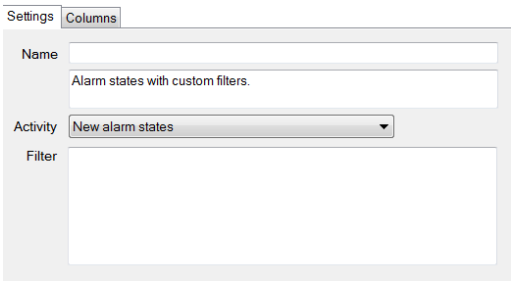
Columns

- Selection of columns

ALARM ANALYSIS

The **Alarm Analysis** sub report is similar to the Alarm Custom sub report except that the Activity is selected from a pre-defined list. See the **AlarmAnalysis** template as an example.

Settings



- **Activity**
  - New alarm states
  - Active alarm states
  - Active/Acknowledged alarm states

Columns

- Selection of columns