KHRONOS INSIGHT

Module Summary

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The Start Group Pty Ltd

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Khronos Insight Module Summary

This document describes the various modules available in Khronos Insight, and provides a high-level introduction to the features and facilities available in the product.

Overview

Khronos Insight interprets and contextualizes data from your control, business, and laboratory systems to provide an accurate representation of production performance and availability. Khronos Insight is applicable to any industry, including mining and bulk-material handling through to consumer-packaged goods. Khronos Insight is an all-inclusive package comprising:

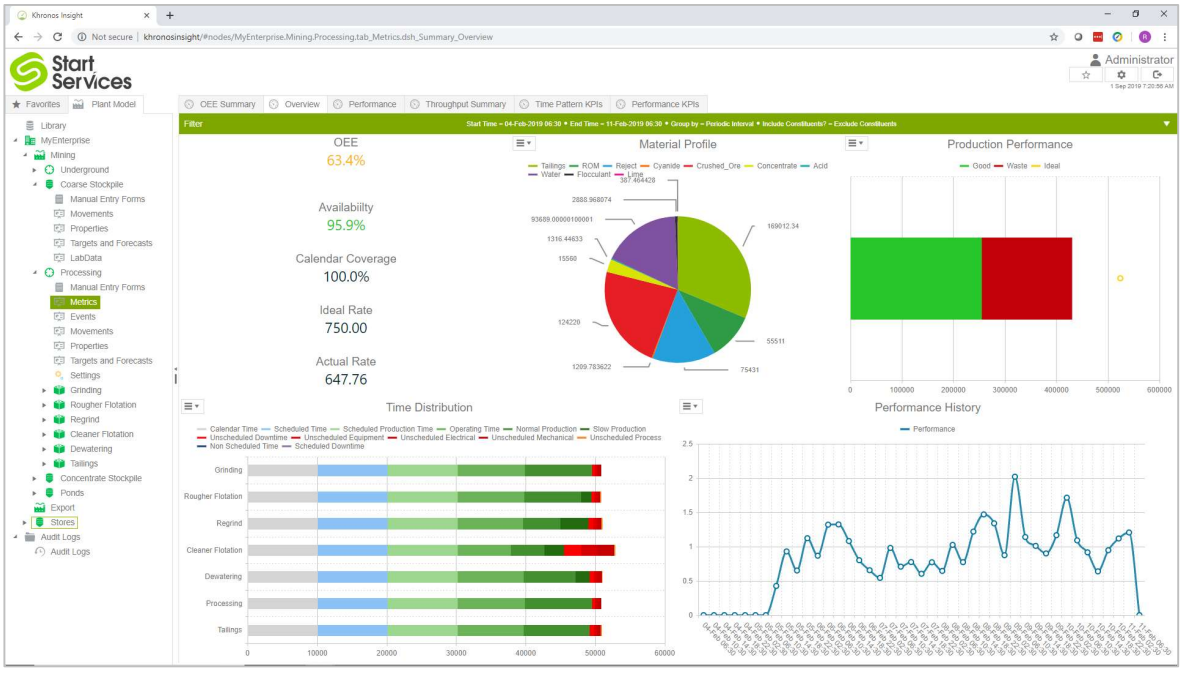
- KPI Metrics with Live and Historian dashboards
- Downtime / Loss Accounting
- Production Reporting
- Inventory Reporting
- Asset Reporting
- Quality Integration
- Operator Logs
- Scheduled Checklists
- and a Document Library

Khronos Insight is designed to report:

What you made;

When and **where** you made it; and

How well you made it.



Khronos Insight provides a single user-interface across all modules, and shared data between production, downtime, accounting, and reconciliation facilities. The shared data philosophy improves data integrity across the site because all modules are reporting over the same underlying information. For example, when Production data is modified to correct an instrument bias, it is instantly reflected in the Downtime module's Lost Production result.

Module Summary

Khronos Insight includes the following facilities:

Downtime Accounting

Designed to clearly identify root causes of stoppages and slow production periods, the Downtime Accounting module reports the business impact of planned and unplanned stoppages by correlating production losses with the events.

Downtime data is recorded as Events which relate back to a customer-defined Time Classification Model based on the Cause Location and Reason. Causes can be assigned manually by operators, or automatically based on values from the control system. Production Loss information is sourced from the Production Reporting module, ensuring identical statistics across both systems.

For maximum benefit, it is recommended to automatically capture downtime events based on rules over the process historian data to generate accurate timestamps and durations against which causes can be assigned. Rules can include deadband times and signal debouncing to prevent flooding of high-frequency or short-interval events.

Production Reporting

Designed to clearly identify all material movements in the process, the Production Reporting module reports Material Types, Quantities, Sources, and Destinations as they move through the process. This module can record all material movements in the process including consumables, reagents, flocculants, and incidentals to accurately identify systemic losses or bias, and allow manual data corrections by appropriately authorised personnel.

For situations where instrumentation is not available, this module supports **Calculated Movements** which allow material flows to be derived from others. For example:

- Unmeasured Tailings can be derived from the difference of Infeed and Concentrate Outfeed.
- Unmetered Water mass can be calculated as a proportion of primary product flow.
- Metal content can be calculated from primary product flow and LIMS grades

Materials which are components of the primary material flow are treated as **Constituent Materials** and reported separately from the primary materials to prevent double-counting in reports. Production Performance is reported against Ideal (nameplate) Capacity, and user-defined Targets.

Inventory Reporting

By tracking all sources and destinations, the running and net balances in Process Areas and Storage Units can are generated, including historical profiles of storage balances. This module supports user entry material movement adjustments, data corrections and overrides, surveys, stock exhaustions, and stock-takes with a complete audit trail of all adjustments and changes in values.

Asset Reporting

The run hours, number of starts, number of machine cycles, throughput quantity, and energy consumed can all be accumulated and reported for each Functional Location in the process model. Each item can be individually reset (or set) at different points in time, and data accumulation will continue from that reset

point forwards. For example, the throughput quantity on a Launder might be reset at each replacement interval (e.g. 10,000t), while the run hours on a generator might be reset after each major refurbishment.

When individual Assets are installed and registered at a Functional Location, the accumulating statistics will be reported against each Asset separately from the Location based on the periods of time the Asset was in service at each Location. When Assets are moved to alternate Locations, the accumulated run hours of the Asset move with it, and can be reset independently of the Location at which it is registered. Assets can be placed into service, out of service, off-site and so on, supporting complete life-cycle data accumulation for each Asset.

Quality Integration

Khronos Insight can link onto external databases including Laboratory Information Systems (LIMS) to acquire supplementary data to better explain the production process. Typically LIMS data describes the quality of material being processed and can be used in conjunction with Production Throughput quantities to calculate yields, recoveries, precious metal mass, and so on.

This module includes charting of the external LIMS data, local Override of the linked data (without overwriting the source), and correlation against Material Movements in the Production Reporting module to intelligently link quality results retroactively or forward-looking using the Sample Timestamp.

Information Logs

Information Logs support an unlimited number of configurable Log Categories, enabling electronic entry of a wide variety of information such as Safety Incidents, Environmental Excursions, Absenteeism, or Maintenance Requests. The Log Categories are easily configured, and assigned to different locations in the Plant Model. Logs can leverage configurable lists of Priorities, Impacts, Assignees, as well as up to 120 additional data fields with customisable labels. Information Logs are used to migrate traditional paper and spreadsheet data into an online, centralised, searchable and filterable repository, with audit trails for transparency of all data changes.

Log Category examples include Health, Safety, Environment, Process Issues, Maintenance Requests, and so on. There is no limit to the number of Categories which can be defined. The entire history is searchable by Category, Topic, User, Plant Model, or content including wildcard searches.

Log entries can be included in shift and other reports based on the time-period they were relevant to. If Logs are kept open for extended periods, then they will appear in all shift (and other) reports which are relevant throughout the period that the entry was open.

Scheduled Checklists

Scheduled Checklists are designed to capture data which is not available electronically at different stages of the process. For example, hourly visual inspections might be required while running normally, while a one-off prestart checklist might be required at the commencement of every Shift or Production Run.

Checklists can be scheduled to different parts of the Plant Model on a Periodic or Triggered basis depending on their purpose. Checklists can be configured so that data must be entered within a nominated time horizon, otherwise they are closed and locked (based on security privileges). This ensures that personnel enter information close to real-time, rather than bulk-editing all checklists at the end of their shift.

Scheduled Checklists can be disabled during periods where the Checklist is not appropriate (e.g. during cleaning phases or non-production periods), or triggered on commencement of a new Production Run or change in Production Mode.

Multiple types of checklists can be configured, and assigned to different areas of the Plant Model on different schedules. Up to 120 flexible entry fields can be configured for each Checklist Type, with configurable labels and entry types (e.g. tickbox, numerical, short-text, long-text). Checklists can also leverage predefined pull-down lists, to restrict user selections to only values which are suitable for a specific purpose.

Checklist information can be included in shift and other reports, or sent to the Quality Assurance Manager via email at the end of shift (as an example).

Document Library

The Document Library allows personnel to access Standard Operating Procedures (SOPs), Work Instructions, Drawings, Guides, and other documents both on their desktop and on mobile devices while in the field. It is designed to support a modern, mobile workforce by providing information-on-demand.

The Document Library supports the uploading of documents, spreadsheets, powerpoints, images, photos, and other files into a centralised document registry with strong categorisation by Subject, Category, Vendor, Product, Topic, and general Descriptions. When new versions of a file are uploaded, the old ones are archived in a version-history, and still accessible via the historical register.

Leveraging browser add-ins, documents can be opened in-situ within the browser window, or downloaded to the client machines. The library is protected by domain security so that only personnel with appropriate permissions can upload or replace documents, or modify the document meta-data.

In this latest release, the Document Library can be used to categorise and publish links to documents held in external repositories rather than duplicating document storage locally.

Metal Reporting

This module is an engineered extension to the Production Reporting module whereby the reporting of primary and secondary Material Movements through the process is expanded to include the Constituent Material Movements within the overall flow. Constituent Material Movements identify the individual components of an overall movement by combining the overall Movement Quantity with Assay Data to identify the proportions of metals, moisture, reagents, or other components as appropriate to the process.

Yield, Recovery, and Metal Losses can be reported on using formulas over the Constituent Quantities in relation to different parts of the plant model.

Product Features

Underpinning the above modules is a powerful platform which supports:

- HTML 5 native browser client with no client-side downloads or installs
- Mobile aware browser client with adaptive forms and displays for small format devices
- Camera integration on mobile devices to record live photos against events and other records
- Native connectivity to OSI PI, FactoryTalk Historian, and MS SQL Server
- Pass-through connectivity to MS SQL Linked Servers
- Data processing from Historian data sources to facilitate backflushing, reprocessing, and buffering
- Automatic reprocessing of recent data to accommodate non-chronological or late-bound data (e.g. lab assays)
- Manual reprocessing of archived data to perform bulk-backflush activities over long time ranges
- Flexible KPI algorithm engine for custom definitions in addition to the out-of-the-box formulas
- Supervisor confirmations to lock-down values and prevent further changes
- Audit trails for all data changes or entries made by users
- High-performance data retrieval and reporting
- Reporting in the context of configurable time-intervals (shifts, production days, maintenance weeks, etc)
- Reporting over both standard and custom time-intervals
- User-defined Favorites for quick-access to frequently used dashboards
- User-defined Analysis Cubes for data pivoting, filtering, shaping, export and analysis
- Excel data export for any displayed data from within the browser client
- Awareness and support for world-wide time-zones, daylight savings transitions, and roaming users
- Active Directory integrated security with support for Groups/Roles for simple user management

- Optional Email-based logins, with support for system access control by administrators, and self-service password management
- SSL security compatibility

Khronos Insight is complemented by other products in the Khronos Suite including:

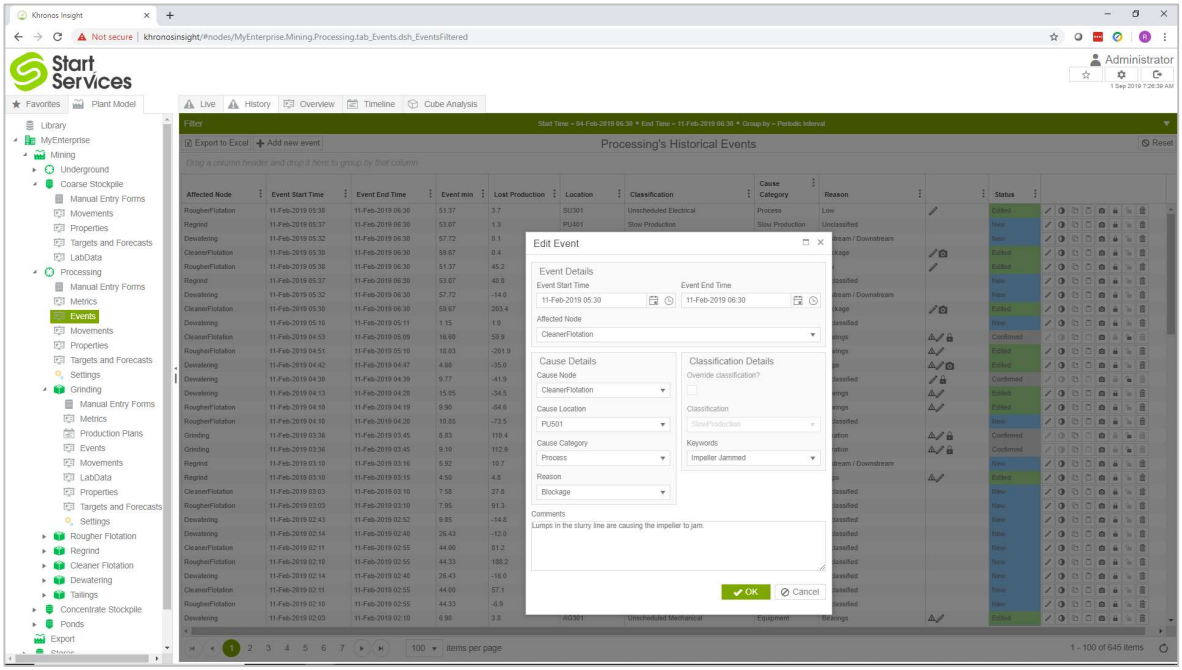
Product	Description
Khronos Excel Pump	An ETL engine to pull data from Excel spreadsheets and transform into MS SQL databases. Khronos Excel Pump interprets tabular and non-tabular Excel spreadsheets using configurable rules, and pushes the data into MS SQL databases either directly or via stored procedures. Khronos Excel Pump is primarily used to pull desktop data into normalised, central repositories (including Khronos Insight), for use by production reporting systems.
Khronos SQL Pump	An ETL engine to pull data from MS SQL databases and transform before pushing into secondary MS SQL databases. Khronos SQL Pump allows data transformation during the data retrieval operation, and pushes transformed data into secondary MS SQL databases either directly or via stored procedures. Khronos SQL Pump is primarily used to pull database data from 3rd party systems and transform it as part of consolidating data for use by production reporting systems. It is also used to push on-premise data into cloud-based databases such as Azure SQL dB for use by cloud-based reporting systems such as Power-BI.
Khronos Historian Pump	A direct data pump from OSI PI or FactoryTalk Historian to MS SQL databases. Khronos Historian Pump pulls data for selected tags and pushes it efficiently into SQL databases. Khronos Historian Pump is primarily used to push high-density production data into cloud-based databases such as Azure SQL dB, making it available to cloud-based reporting systems such as Power-BI.
Historian Backfill Utility	A bulk-data backfill utility which pulls data from legacy Citect SCADA Trend files and pushes it into centralised historian repositories. The Historian Backfill Utility can source from both 2-byte and 8-byte trend files across Citect v5 through to 2018. It supports pushing to OSI PI Historian, FactoryTalk Historian, and exporting to CSV files.

Downtime Accounting

Downtime and Slow-Production detection rules are configured against historian tags and expressions to automatically capture periods of time where the process was operating abnormally. The benefits of the Downtime Accounting module are:

- Statistical based evidence to justify business decision making
    - What are the biggest causes of lost production?
    - What maintenance to prioritise?
    - What upgrades to perform?
    - What are the bottlenecks to throughput?
    - Why aren't we achieving our design capacity?
    - Which products or operating modes are causing the most issues?
- Ease of access to data
    - All downtime, causes, and annotations are stored in a central, accessible location
    - User-friendly, web-browser interface and data export facilities
    - User-driven Analysis Cubes
- Site-wide visibility for near real-time decision making
    - Upstream and downstream production teams can identify whether dependent processes are going to impact their areas of responsibility in real-time
    - Real-time KPI results for the current shift / production period
- Automated reporting
    - Scheduled reports distributed via email to key stakeholders
    - On-demand dashboards for detailed analysis
    - Out-of-the-box query-set for integration with Power-BI and SQL Reporting Services

Events are typically captured automatically from the Production Historian, and Cause Locations and Reasons can be assigned automatically based on instrumentation and control signal expressions. Operators can manage events through the web-based interface, including reclassifying events by identifying alternate cause locations and reasons to the defaults, splitting events to identify different reasons for a single stoppage, annotating the incident, or manually adding events for situations where automatic detection is not available.



Khronos Insight can automatically assign new events to upstream/downstream classifications if other events are already active in this, or parallel, process areas, reducing the load on operators to manage reclassification activities.

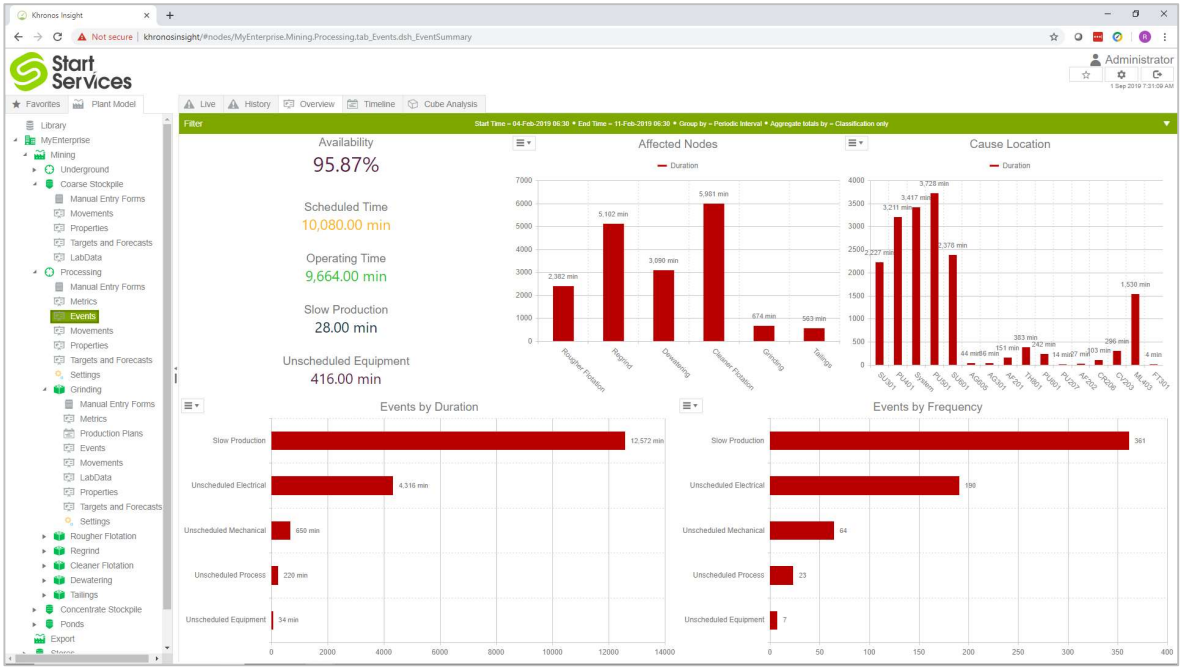
Khronos Insight aggregates downtime up the plant hierarchy (the plant model), to accurately report total downtime across areas and sites based on the underlying events in constituent process centres, in the context of a user-configured Time Classification Model.

Faults

Events are automatically identified as Faults or non-faults based on the assigned Location and Cause combination. Fault events (such as overloads) contribute to Mean Time to Failure statistics, while non-fault events (such as motor isolation) do not.

Lost Production

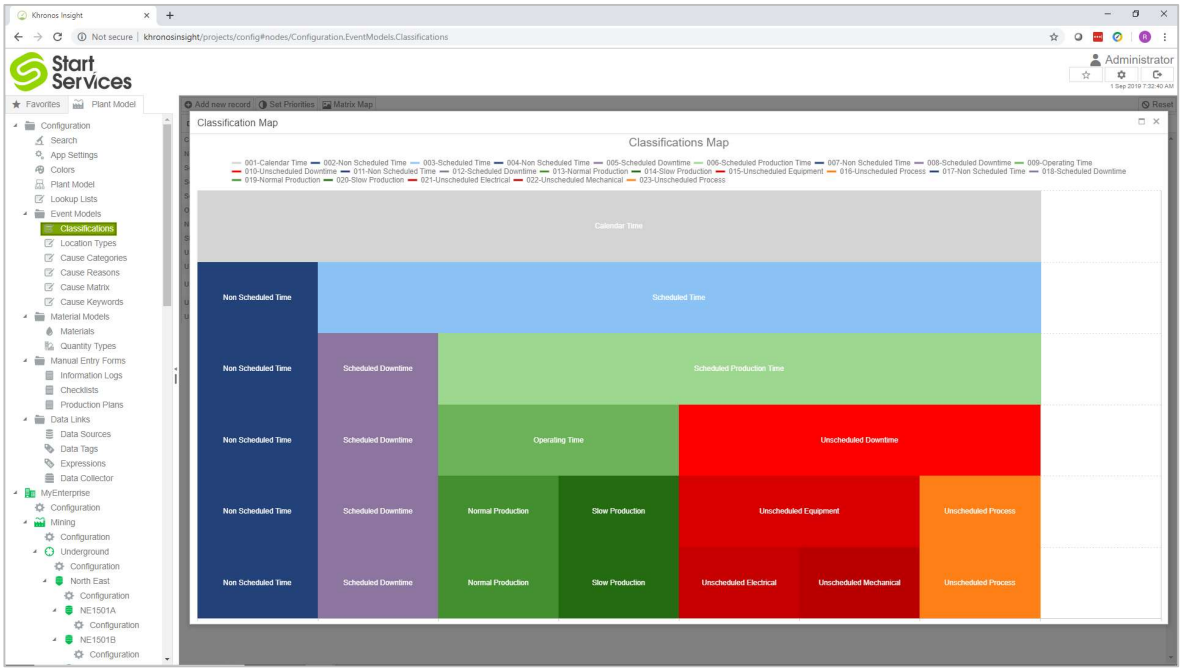
Lost Production is calculated on a per-event basis, based on the difference between the Ideal Throughput Rate (nameplate rating), and the actual production quantity. When events are grouped by time-periods (such as shifts or hourly), the lost production is calculated independently for each interval. When Lost Production is compared to the Ideal Production, it generates the Performance statistic for the event, also known as the effectiveness of the event.



Time Classification Model

Khronos Insight supports a configurable Time Classification Model. When events are allocated to Cause Locations and Reasons, this combination identifies which Time Classification the event belongs to based on a Location / Cause matrix. This matrix supports templatising of equipment and location types, for efficient management of Reasons across similar types.

The total duration and event count for any given Time Classification is automatically accumulated in that classification, and all parent classifications, for each reporting interval. In the example above, Unplanned Equipment Downtime is the sum of all Unplanned Electrical and Unplanned Mechanical downtime.



Data Confirmation

Appropriately authorised users can Confirm events, locking them down and preventing any further updates or changes by either the reprocessing engine or other users. Locked data can be unlocked by system administrators if required.

Downtime KPIs

As well as data management dashboards and forms, Khronos Insight provides a variety of visualisation dashboards and reports, with easy-to-use filtering and range selections. Out-of-the-box KPI results include:

- OEE
- Availability
- Utilisation
- Reliability
- MTBF
- MTTR
- Time Classification durations and ratios (Operating Time, Unplanned Equipment Downtime, etc)

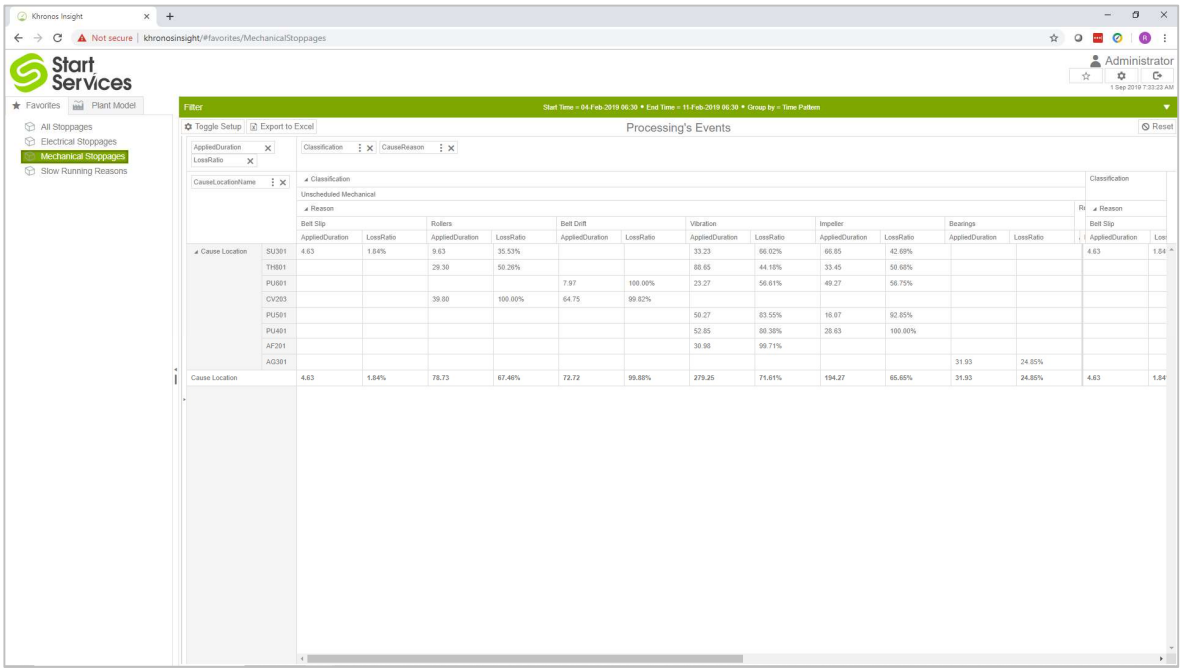
As well as supporting configurable additional KPI formulas, the standard formulas can be edited to best suit different customer needs.

Analysis Cube and Favorites

The Analysis Cube allows individual users to tailor the event data to suit their role in the business. For example, the Electrical Superintendent may be interested in all Unplanned Electrical Durations, grouped by Cause Location and Reason, while a Process Analyst may be interested in Lost Production for all Slow Production events grouped by the Affected Location.

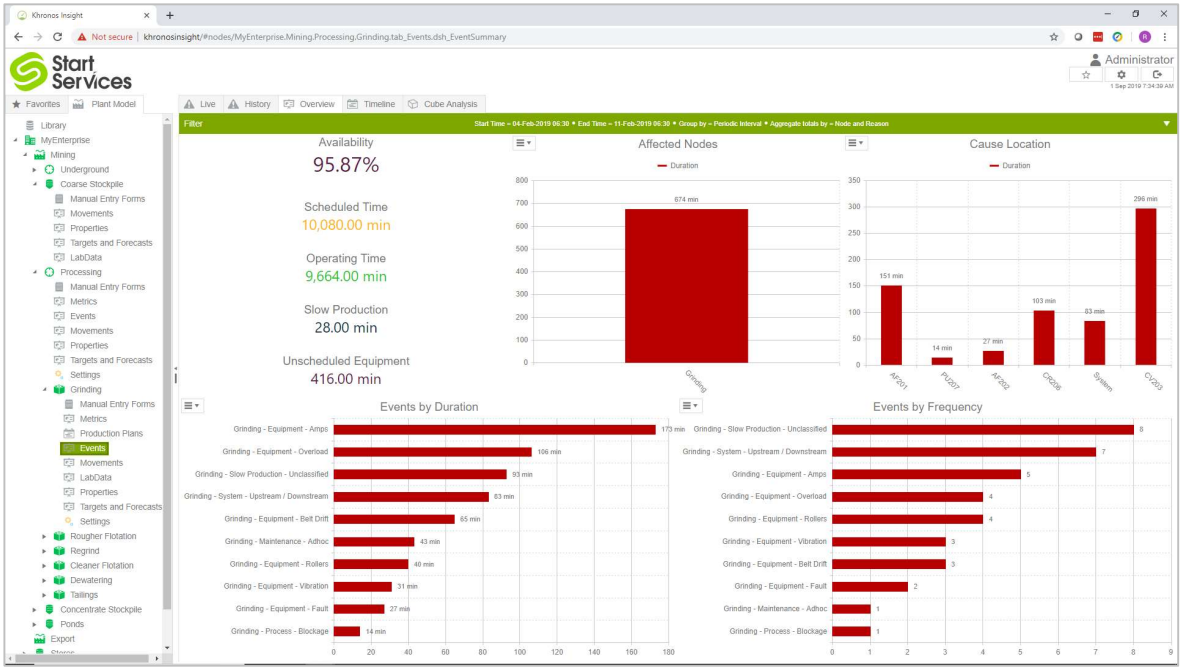
The Analysis Cube allows users to select which fields they want to use for Rows and Columns, and which Measures should be aggregated into the Cube. Filters can be applied to fields to focus the Cube on a targeted area of interest.

Once complete, the Cube can be saved as a Favorite, providing a shortcut to the structure for quick retrieval at a later time. Like all dashboards, Cubes can leverage a *Relative Time Filter* such that each time it opens it always shows recent data (e.g. yesterday's Production Day).



Summary Dashboards

Summary dashboards allow users to group and aggregate event durations and frequencies on a flexible basis. Users can select to group by Affected Location, Cause Location, Cause Reason, Category, Time Classification, or a variety of other options to best suit their needs. All display graphs support the ability to access the underlying data as a table (including fields which are not displayed in the graphs), and export to Excel.



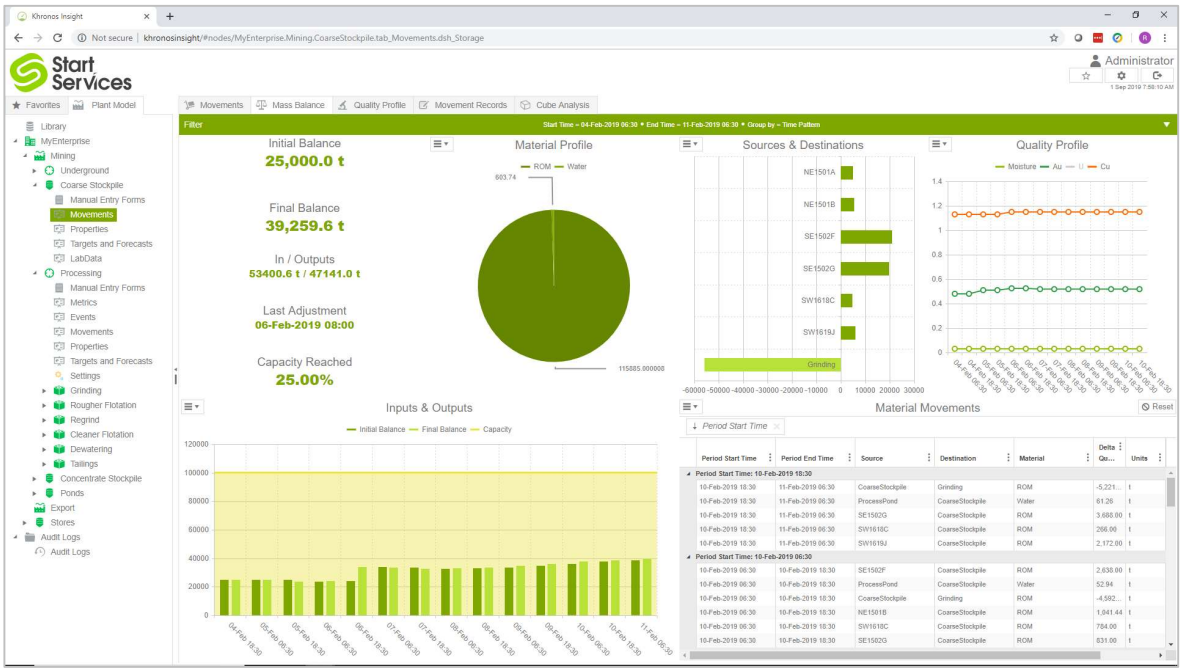
Production and Inventory Reporting

Khronos Insight reports on production by measuring the movement of Materials between and through processing centres and storage units. Khronos Insight supports an unlimited number of material flows, including upstream flows, and accurately reports on the total net production for each process centre. Benefits of the Production Reporting module include:

- Comprehensive reporting of production including:
  - All inputs, outputs, and balances of materials in each process centre
  - Running balances of materials in processing units
  - Net balances of materials in storage units
  - Production Performance KPIs
- Stock Management
  - Stock adjustments, aerial surveys, draft surveys, exhaustion, etc
  - Quantity overrides to counter calibration or instrument bias
  - Audit trails to provide transparency over data values, changes, and user adjustments
- Ease of access to data
  - User friendly web-based UI and export facilities
  - User-driven Analysis Cubes
- Automated reporting
  - Scheduled reports distributed via email to key stakeholders
  - On-demand dashboards for detailed analysis
  - Out-of-the-box query-set for integration with Power-BI and SQL Reporting Services

Production Information is typically captured automatically from the Production Historian by interpreting values from flow rates, totalisers, resettable accumulators, and the like. Data can also be sourced from Fleet Management, Shipping, Planning, and other sources. Khronos Insight captures movements of Materials between work centres, process areas, and storage units. Material Movements include the Source and Destination of the movement, the Quantity, and the Material being moved.

By capturing the source and destination of each material movement, Khronos Insight can present Running Balances of materials in each process centre. If the Stocktake Adjustment facility is used, then Khronos Insight can provide an estimated net-balance quantity for materials in storage units, providing estimated warehouse, bin and stockpile quantities on demand.



Movement configuration options include:

- Dynamic detection of the material being reported
- Dynamic detection of the source process centre
- Dynamic detection of the destination process centre
- Built-in aggregation for totalizers, flow rates, discrete units, etc
- LIMS integration, with built-in capability to apply assay results retroactive or proactively to associated material movements

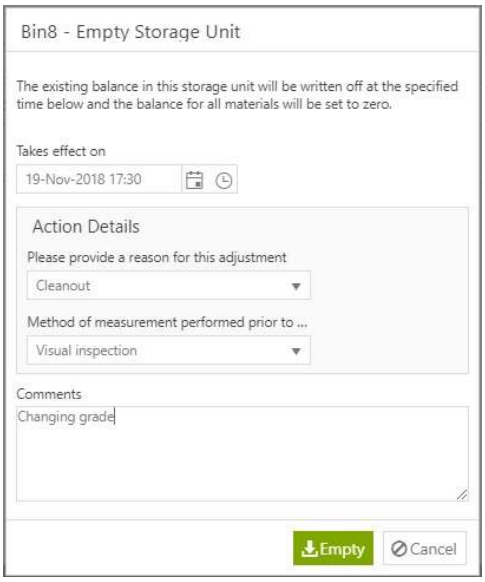
Khronos Insight supports the concept of **Constituent Movements**, whereby a single material movement could be comprised of multiple constituent components such as silver, lead, and zinc alongside the non-precious mass (tailings and water) in a slurry line. Tagging a Material as a constituent component causes Khronos Insight to isolate it from the overall balance and stocktake activities (to prevent double-counting), while also enabling running-balance statistics over the constituent components through the process. This enables metal-balance statistics to be generated by the system, provided sufficient instrumentation and assay results are available to measure the materials accurately.

Data Adjustments and Reconciliation Write-Backs

In bulk-commodity industries such as mining or grain handling, the measurements of quantities as reported by the production system are frequently incorrect. This may be due to calibration errors, operator errors, physical constraints, instrument or process bias, or simply a lack of appropriate instrumentation. Similarly, the Source and Destination may have been recorded incorrectly (e.g. a truck delivered to the wrong stockpile), and needs to be corrected.

Khronos Insight allows appropriately authorised users to override the recorded data to correct it. This facility is only available to users of suitable security groups, and includes a full audit trail of all changes made to data.

When the user overrides a Material Movement Quantity over a period of time (e.g. a shift or a month), the new quantity is prorated across the underlying movement records in the database to ensure that the flow profile is retained, with a quantitative shift based on the adjustment entered. Khronos Insight stores both the Original Quantities and the Overridden Quantities side-by-side to provide transparency and clarity of data, as well as maintaining an audit trail of all changes made to the data.



Types of manual adjustments available include:

- Aerial survey stocktakes
- Dip measurements
- Registering storage units as empty
- Exhausting stockpiles
- Rolling over stockpiles
- Delta stocktake adjustments
- Absolute stocktake adjustments
- Changing a Source or Destination on an individual movement

Appropriate forms are available natively within the system to cater for these types of data corrections and adjustments.

Sample Measurements

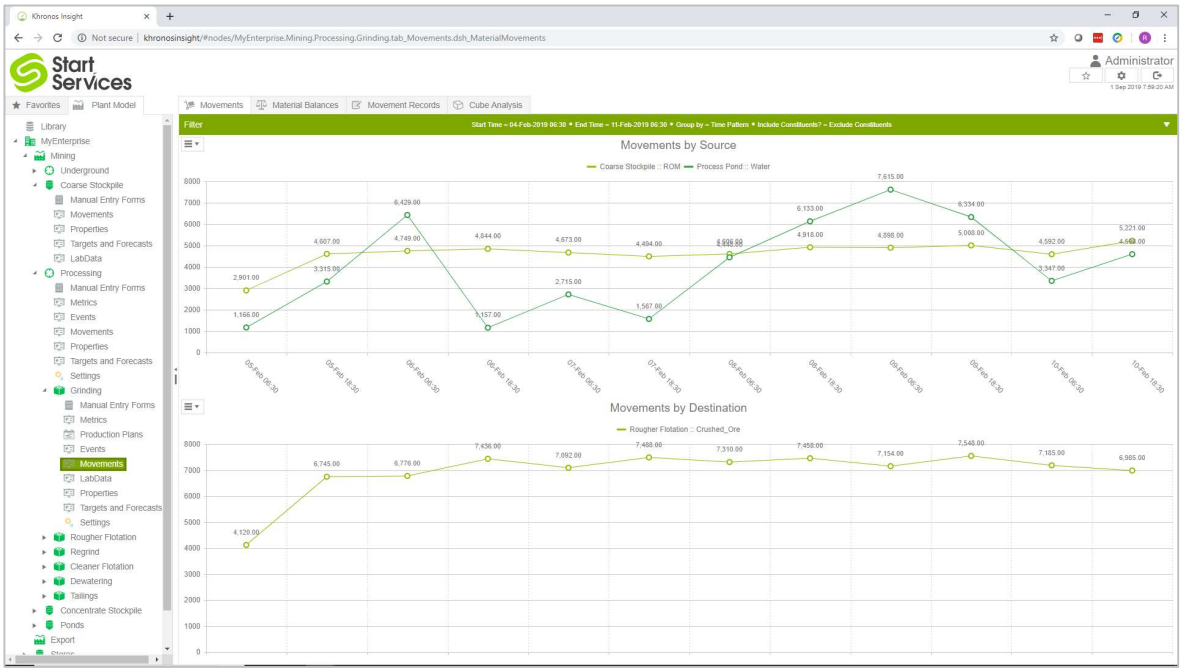
Sample Measurements are configured to integrate with either historian tags or laboratory systems to identify qualitative measurements associated with the material movements. This allows Khronos Insight to report the

quality of the materials being recorded in the Production Module. This module is a key-enabler to the Metal Reporting Module, whereby Sample Measurements can be combined with Material Movements to derive additional results for reporting such as the gold mass in circuit (Constituent Material Quantities described earlier).

Sample Measurements typically reference a single Sample Reference Identifier (such as a Lab Sample ID), and link multiple measurements to that single identifier and its associated timestamp. For example, one reference sample might measure the grams per tonne of silver, lead and zinc producing three results for a single reference.

Data Grouping

Khronos Insight can group, filter and pivot data using standardized time-intervals (such as shift patterns), or it can be configured to calculate time-intervals dynamically based on other process signals or inputs. This can be useful when attempting to view production or downtime statistics by Crew, Batch, Order, Campaign, Operating Mode, Recipe, or other dynamically changing aspects of the process. Users can select these configured items in the filter bar to retrieve and group data.



Data Values

In addition to material movements, sample measurements, and events, other process data is typically required for reporting (e.g. Maximum temperature of the motor). Khronos Insight allows data capture rules to be configured for any number of additional data items which are required for reporting. Values can come from historians or databases, and support detection and aggregation of data by:

- Changing values (with debounce and deadband options)
- Regular periodic intervals (with totalisation, time-weighted averaging, min/max, start/end, etc)
- Trigger detection

Data Values can then be integrated into formulas, data exports, trends and other presentation content.

Targets and Forecast Values

In addition to the Ideal (nameplate) Capacity, many customers have their own production Targets or Forecasts which production is measured against. Khronos Insight allows different targets to be defined for different plant areas, and allows updates of these values as they change over time. Values only need to be

updated when they change, with subsequent reporting intervals using the last entered value as their targets for new reporting periods. This minimises data entry and data density in the database.

In many cases, production Targets are mastered in Excel or other external systems. Khronos Insight supports the automated bulk-import of new target values from Excel or other sources using the Khronos Data Pump utilities.

In many cases, different Target values are used for different time horizons. For example, there might be an **Annual Budget Target** for Availability, a **Monthly Forecast Target**, and perhaps a **Daily Target** for short-term, detailed planning and reporting. Khronos Insight allows the same target metric (e.g. Availability) to have different values for the same time period, by placing the values into **Target Groups**. In the above example, a separate Group would be created for Budget, Forecast, and Daily metrics, and the Availability Target would exist in each group with different values and time horizons.

Targets and Forecasts can be integrated into formulas, data exports, trends and other presentation content.

Data Confirmation

Appropriately authorised users can Confirm a block of data, locking it down and preventing any further updates or changes.

Performance KPIs

As well as data management dashboards and forms, Khronos Insight provides a variety of visualisation dashboards and reports, with easy-to-use filtering and range selections. Out-of-the-box KPI results include:

- OEE Performance
- OEE Quality
- Ideal Production quantity
- Total Production quantity
- Good Production quantity
- Waste/Reject Production quantity
- Running Balance
- Net Balance

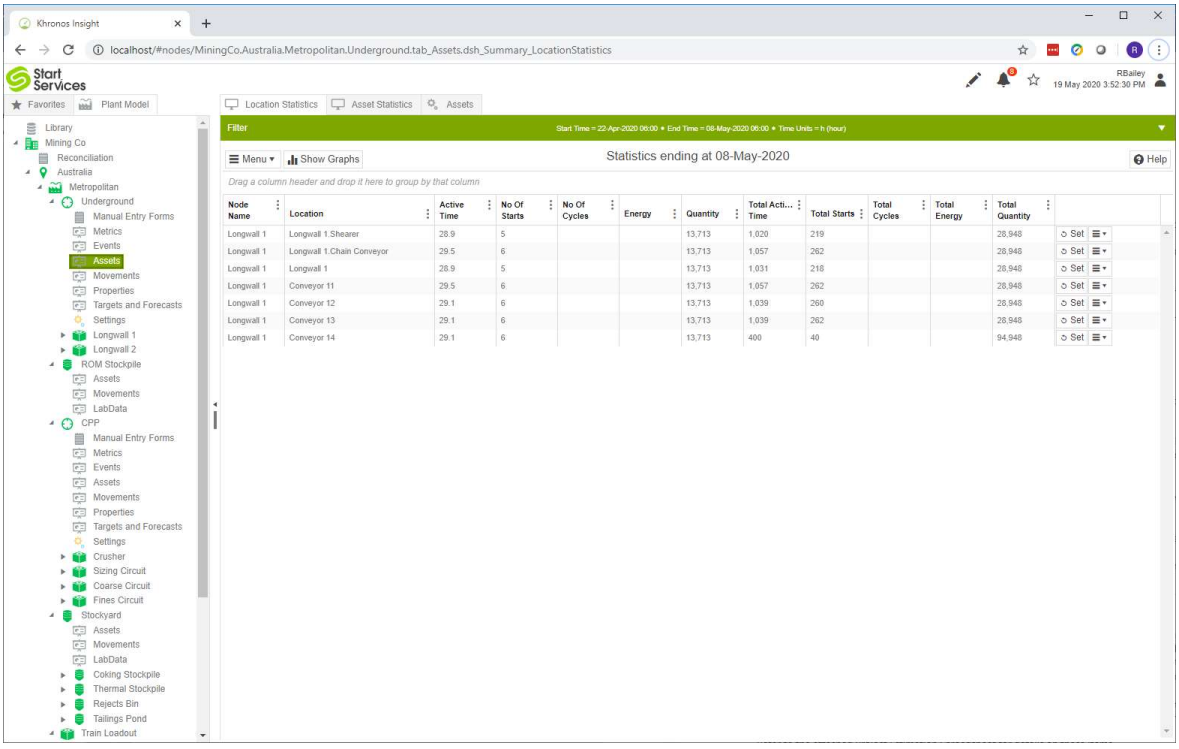
Asset Reporting

Khronos Insight's Asset Reporting facility allows individual accumulation of key statistics for each Functional Location within the Plant Model. For example, the Crushing node in the Plant Model might have two-hundred Functional Locations within it identifying individual pumps, valves, conveyors, mills, chutes, gates, tanks, and so on. Typically, these Functional Locations are part of the static functional model, while the Assets registered at each Location can change over time (e.g. the motor at Functional Location PU101 is swapped out for refurbishment). Khronos Insight can capture and accumulate these key statistics for both the Functional Location, and the individual Assets at each Location independently.

Available statistics include:

- Run Hours (Active Time)
- Number of Starts
- Number of Machine Cycles
- Quantity of Material Processed / Conveyed
- Energy Consumed

Statistics are presented both for the requested reporting interval, as well as Totals for the entire accumulated life of the Functional Location since the last reset point.



This module links onto historian data tags to identify running signals and automatically accumulates time and active transitions to record run hours and starts. Similarly, it can calculate energy consumption either from metered signals (either by integrating kW or totalising kWh), or it can calculate approximate energy from the motor current, voltage, phases, and power factor.

When a major service interval occurs, these values can be reset to zero (or another appropriate value) at that point in time, and statistics will be reset accordingly.

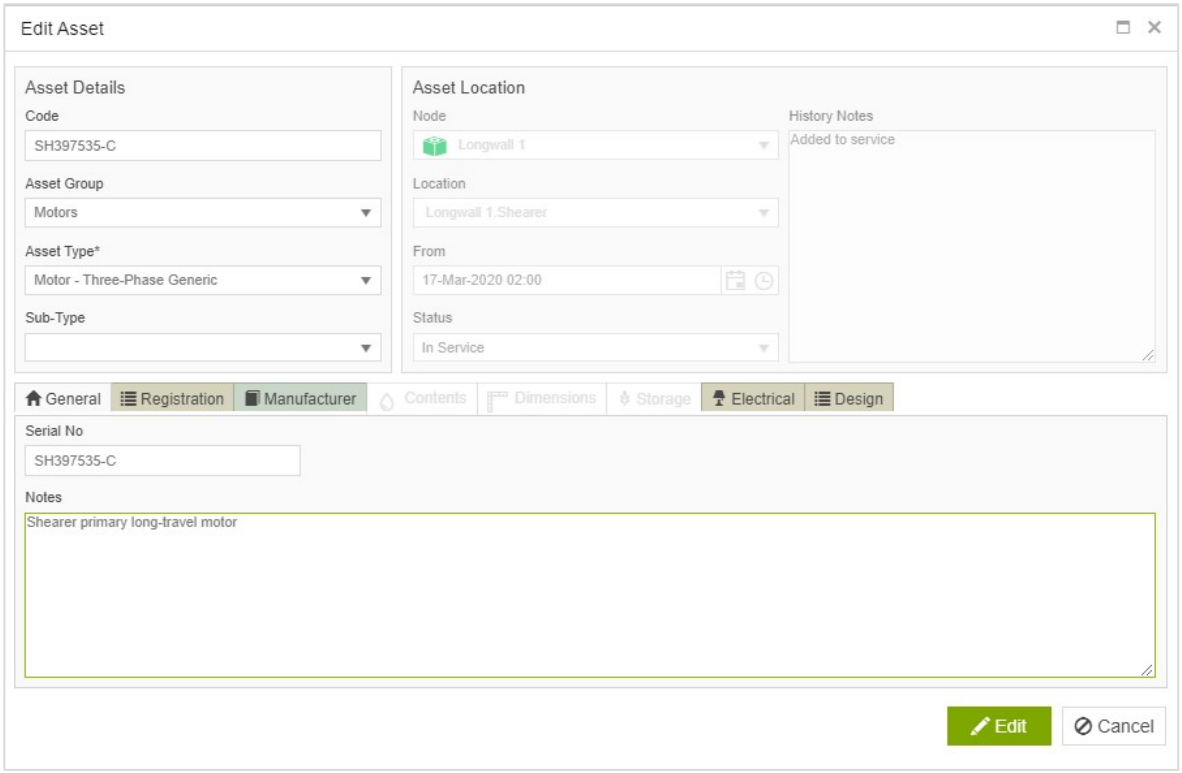
Asset Registry

The module supports an unlimited number of Asset Types, each of which can be configured for different master data. For example, motors can be configured to define the electrical attributes, while storage tanks

might ask for the physical dimensions and volumetric capacity. Each asset is associated with a master type, and only data appropriate for that type is displayed in the asset register.

Assets are placed in-and-out of service at various Functional Locations. Assets typically do not have their own running signals as most process historians will only have tags relating to the Functional Location where the asset is (temporarily) installed. Therefore, Assets inherit the running hours, number of starts, and so on from the Functional Location where they reside. When they are moved to an alternate Location they maintain their accumulated data from the last Location, but start accumulating new data only in relation to the new Location from their new installation date.

This powerful feature facilitates reporting of individual Asset statistics across their entire life-cycle, regardless of how many times they are installed, removed, serviced, refurbished, and re-installed. Statistics for Assets can be reset independently of their registered Location.



Information Logs

Khronos Insight's Information Log facility allows operators to record additional information pertinent to the operation in an electronic log which is centralised, filterable, and searchable. Information Logs are used to capture information in the context of pre-defined Categories such as:

- Shift Handovers
- Safety Incidents
- Environment Incidents
- Production Incidents
- Maintenance Requests
- Departmental Notices

Benefits of the Khronos Insight Information Logs are:

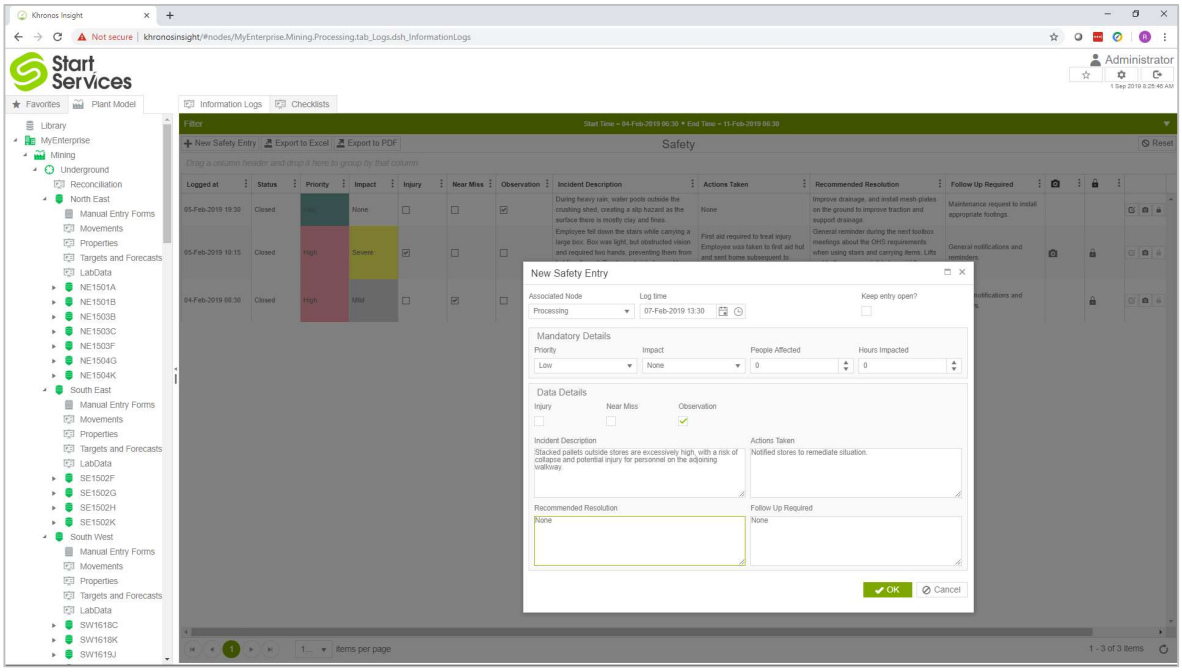
- Ease of data entry
    - Web-based forms, pull-down lists, categories, topics and text entries
    - Facility to attach photos directly from mobile devices (or from stored files)
- Ease of access to data
    - Centralised history of all entries, in the context of the plant model and defined categories
    - User-friendly, web-browser interface and data export facilities
    - Filterable
    - Searchable
    - Exportable
- Management Notifications
    - Provides a facility for management to post notifications which will appear in departmental reports
- Automated Reporting
    - Logs included on departmental and operational reports for as long as they are kept open
    - On-demand access to historical logs for detailed analysis
    - Out-of-the-box query-set for integration with Power-BI and SQL Reporting Services

Information Log Categories are configurable, and each Category can support a variety of optional fields on the user entry form. Categories are then made available to different parts of the Plant Model as appropriate. Optional fields include:

- Priority
- Impact / Severity
- Number of people affected
- Number of hours impacted
- Quantity of items affected, and an appropriate label for the items (e.g. "No of bags added")

When users enter a new log entry, the form will automatically adjust to show only the fields configured for the selected Category, and allow the user to add a Topic and Detailed Description into the log. There is no limit to how many log entries can be created for each Category, and entries are automatically related to reporting periods (e.g. Shifts, Days, etc), based on the timestamp of the log.

Selected Categories can be saved to Favorites for quick access to numerous Categories without needing to change the filter each time.



A log entry can be singular, or it can span a time-range. When spanning a time-range, the entry will be included in reports which relate to that time range. For example, a single entry which remains open for three days, would appear in the Daily Report for all three days.

All logs record the user identity and time of the entry, and audit trails record the identity, time, and details of any changes or updates to the log entry.

Data Confirmation

Appropriately authorised users can Confirm a log entry, locking it down and preventing any further updates or changes.

Log Reporting

The entire log history is exportable, searchable, and filterable within the context of each Log Category. Facilities include searching by Topic, Plant Node, User, or by key-words including wild-cards.

Access to the logs, including searching, exporting, and reporting, is controlled by security to ensure that only appropriately authorised personnel can enter, modify, or view logs in different categories or areas of the plant.

Scheduled Checklists

Khronos Insight's Scheduled Checklist facility allows automatic prompting of tasks, activities, inspections, or quality checks on a periodic or triggered basis, creating an action list of tasks which need to be completed within nominated time-frames. Typical uses for Checklists include:

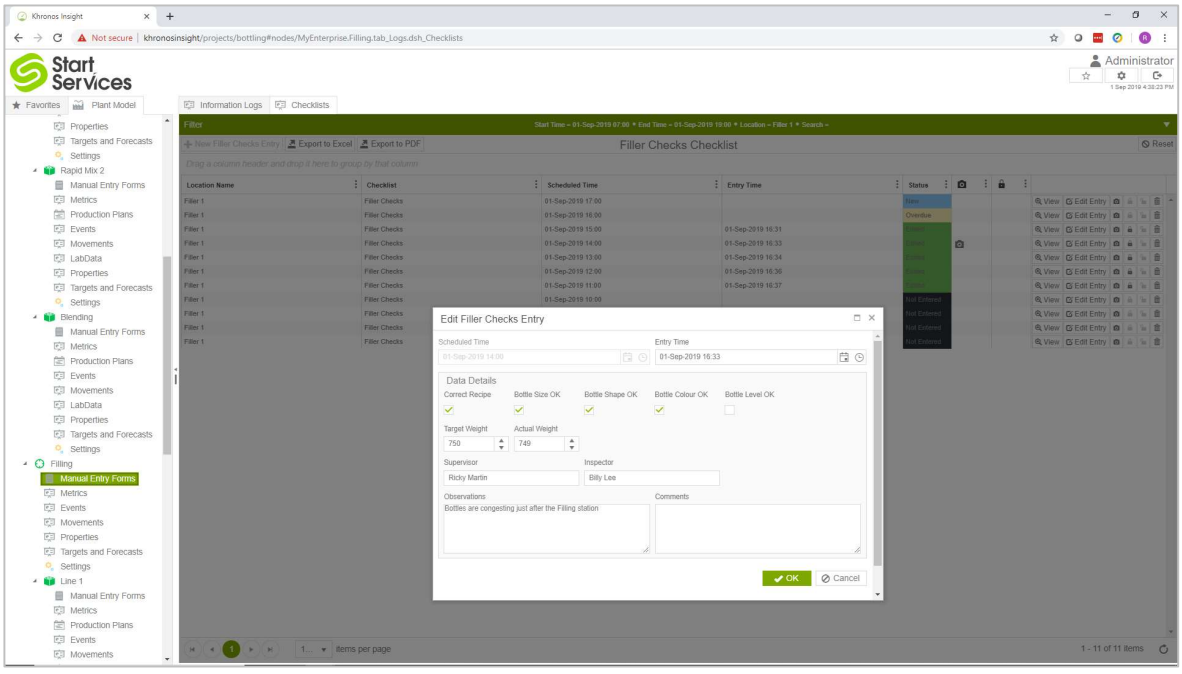
- Periodic 'walk-arounds' to perform visual inspections of the area and confirm that it is clean and tidy
- Regular recording of non-automated instrument gauge readings in the field
- Quality checks that equipment setup is correct for current production modes or products
- Quality checks that produced product is within tolerances
- Prestart checks at the start of a new production mode or shift

Benefits of the Khronos Checklists are:

- Ease of data entry
    - Web-based forms, pull-down lists, categories, topics and text entries
    - Facility to attach photos directly from mobile devices (or from stored files)
- Ability to schedule, and apply time-horizons to entries
    - Flexibility to leave entries open indefinitely, or apply time-horizons to entry

      E.g. Must be completed within 30 minutes of the trigger time, otherwise its locked out for most users
    - Flexibility to provide Overdue alerts and extra time to complete the entry

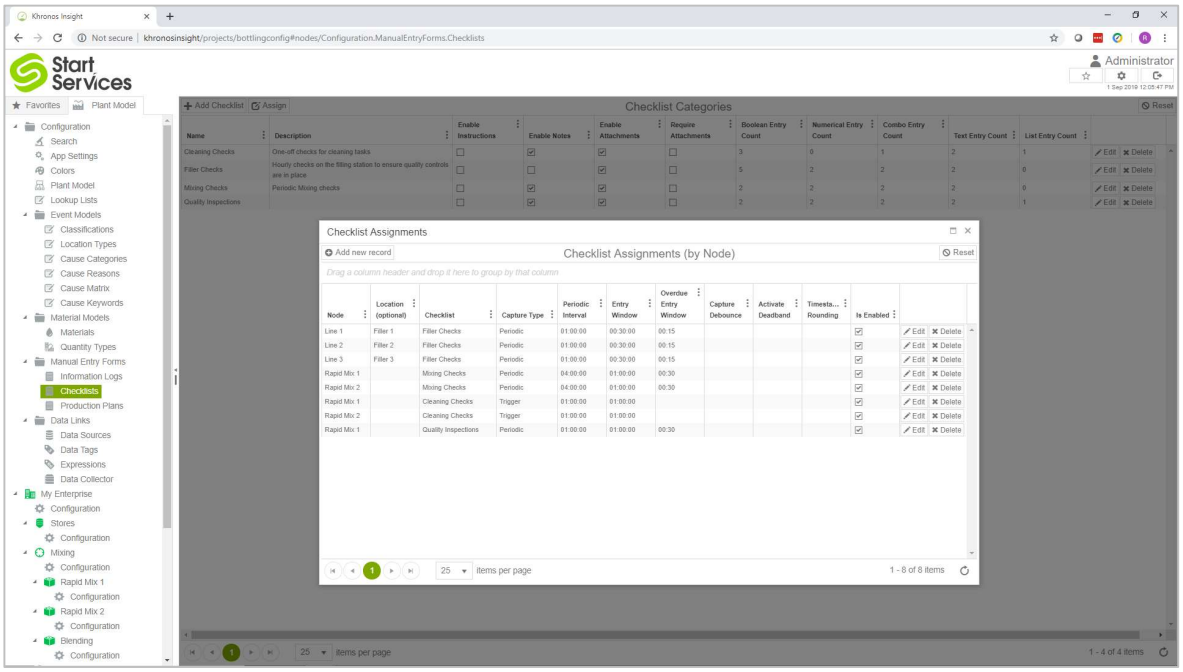
      E.g. After the initial 30 minutes it enters an Overdue state for an additional 15 minutes before being locked out. Subscribing users are alerted to the overdue status
- Ease of access to data
    - Centralised history of all entries, in the context of the plant model and defined categories
    - User-friendly, web-browser interface and data export facilities
    - Filterable, Searchable, Exportable
- Automated Reporting
    - Checklist data can be included on departmental and operational reports
    - On-demand access to entry history for detailed analysis
    - Correlation to Production Runs (and all data therein) to put entries into the context of the process
    - Built-in KPIs for Compliance and Attainment to Schedule to quickly identify whether operators are entering data in a timely manner, and the coverage of entries across different Checklist categories
    - Out-of-the-box query-set for integration with Power-BI and SQL Reporting Services



Checklist Categories are configurable, and each Category can support a wide variety of configurable fields on the user entry form. Once setup, Checklist Categories are made available to different parts of the Plant Model, on different schedules, as needed.

Each Checklist Category can support up to:

- 30 true/false Boolean checkbox entries
- 30 numerical entries
- 30 short text entries
- 30 long text entries
- 10 preconfigured pull-down lists



Checklist entries are timestamped, and automatically associated with the appropriate Time Patterns for reporting purposes.

Data Confirmation

Appropriately authorised users can Confirm Checklist entries, locking them down and preventing any further updates or changes from anyone other than a system administrator.

Checklist Reporting

The entire Checklist history is exportable, searchable, and filterable. Facilities include searching by Category, Topic, Plant Node, User, or by key-words including wild-cards.

Access to the Checklists, including searching, exporting, and reporting, is controlled by security to ensure that only appropriately authorised personnel can enter, modify, or view logs in different areas of the plant.

Document Library

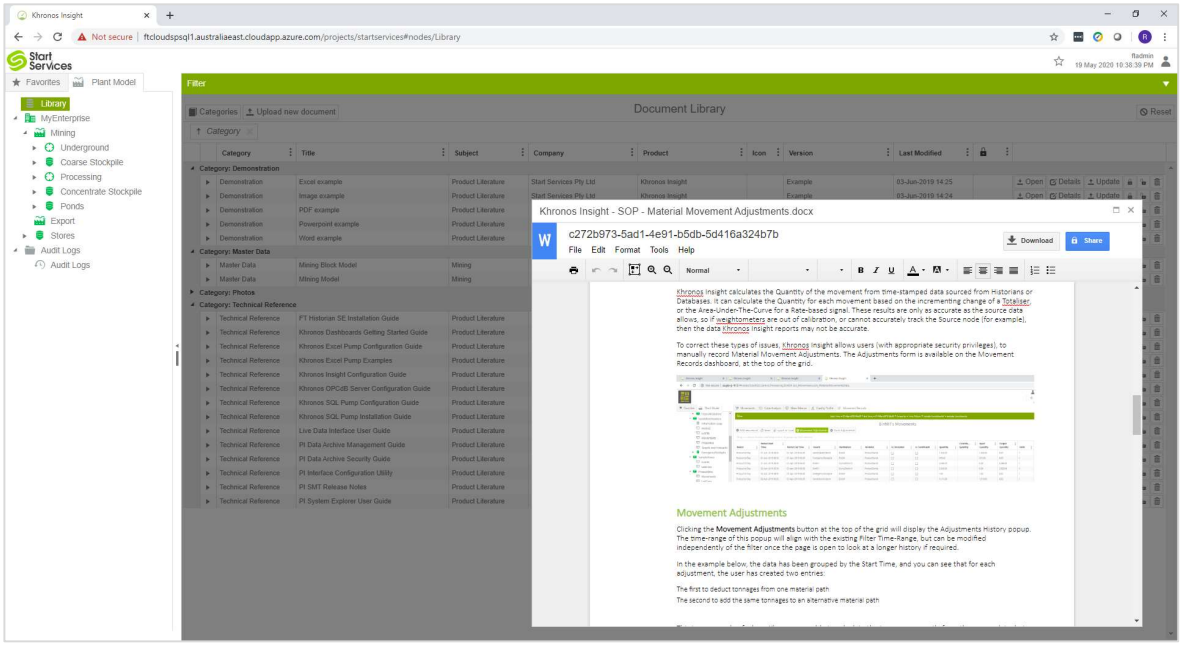
Khronos Insight provides a facility to publish key documents, drawings, photos, images, and files to operations personnel through the web client. Users can search for documents by title, subject, category, and synopsis / description to easily find the documents they are seeking. Documents will open inside the web browser1 without needing to download them.

This facility is primarily targeted at mobile personnel who may require on-demand access to Standard Operating Procedures (SOPs), Technical Reference Guides, Manufacturer Specifications, and other documents while in the field. A key behavioural strategy is to minimise desk and travel time for mobile personnel, and optimise the tools at their disposal while in the field, including access to key documents.

In this latest version of the product, documents from external document repositories can be access by hyperlinks from within the Khronos Insight library and web client2, removing the need to store the documents in two places.

Benefits of the Khronos Insight Document Library include:

- On-demand access to documents from the field, including on mobile devices
- Versioned history of all uploads of documents, and on-demand access to the historical versions if required
- Ease of access to documents
    - User-friendly, web-browser interface with simple search facilities
    - Flexible, searchable document catalogue



[1] Requires a supported browser and office add-in
[2] Requires an external document repository which supports hyperlinks to individual documents

Metal Reporting

Khronos Insight provides a flexible infrastructure to extend the Production Reporting module to include constituent components of material flows and balances to enable engineering of Metal Reporting functionality. A reliable Metal Reporting solution requires comprehensive instrumentation, lab sampling, and analysis results to ensure coverage of the process. If sufficient information is not available, and too many assumptions are included in the model, then the usefulness of the Metal Reporting reporting is limited.

Benefits of the Khronos Insight Metal Reporting module include:

- Tightly integrated with Downtime Accounting and Production Reporting modules, so any data changes which occur in one module are reflected immediately in the other modules
- Flexible framework to tailor solutions to specific site requirements
- Ease of access to data
    - User-friendly, web-browser interface and data export facilities
    - User-driven Analysis Cubes
- Strong security model to control data management and lock-down of results
- Automated reporting
    - Scheduled reports distributed via email to key stakeholders
    - Audit reports provide transparency of data adjustments, stocktakes, and reconciliation events
    - On-demand dashboards for detailed analysis, with drill down to audit history

Key features available in Khronos Insight to support Metal Reporting and Reconciliation activities include:

- Constituent Movement calculations, which relate overall mass-flows to assay samples or online analysers to calculate quantities of metals, moisture, and other components in the overall flow
- Automatic Reprocessing of data to cater for non-chronological data receipt such as lab assay results
- Material Movement Adjustments, which allows bulk-overriding of total movement quantities to support backflushing of reconciled data across a broad time-range, whilst retaining the flow profile of the underlying data content. Khronos Insight retains both Original and Override values alongside each other for full transparency, in addition to the audit log of all data changes
- Quality Adjustments, which allows overriding of LIMS data results within the context of Khronos Insight to account for changes in quality when backflushing reconciled data. LIMS data remains unchanged
- Stock Adjustments, which allows user entry of aerial surveys, dip measurements, draft surveys, and other adjustments to individual storage units or stockpiles
- Runtime Management of storage units, including the creation, exhaustion, or closure of stockpiles, assignment of tripper ranges and capacities of stockpiles
- Data Confirmation to lock down stored data and prevent any further changes from either the reprocessing engine or users
- Audit Trails of all data manipulations, including the original values, modified values, user identity, timestamp of change, and audit notes
- Configurable Forms to allow additional user interface facilities to be added into the system
- Configurable KPIs to allow additional aggregate calculation results to be added into the system
- Configurable Dashboards to allow customised presentation of information to best suit the requirements of each site

Because the details of Metal Reporting and Reconciliation vary greatly from site-to-site, Khronos Insight provides a configurable framework to extend the Production Reporting module to achieve these outcomes, rather than a rigid, pre-configured, out-of-the-box solution. As such, implementation of Metal Reporting functionality is typically performed via extending the base package to tailor the behaviour of each installation to specific site requirements.

Please contact us for more information at sales@startgroup.com.au if this is of interest to you.