EasyProcess DATA Acquisition & Analysis

The software includes a series of functions and services that allow the acquisition, archiving, and analysis of data collected from a virtually infinite number of sensors (TAGS) by any number of equipment, through OPC interface, Network, Serial, CSV, Excel, text, etc. There is no preset limit to the amount of data that can be archived and managed. A series of metadata associated with the raw data groups, qualifies, and integrates the raw data. This allows handling data collection in the form of "processes" or "batches" for which additional data (descriptive, qualitative, etc.) can be collected. An interface module for managing process sequences is available to automatically define the phases involving in turn, one or more equipment.

The management of the processes involves data management by product and production lines, defining the sequences of equipment usage and the rules that such sequences must follow. At any time, data relating to equipment, processes, and/or time intervals can be easily extracted, and it is possible to request the graph of the trend of one or more TAGS. Regarding the graphic representations , it is possible to define a series of presentations of different TAGS, combinations of them, even together the result of predefined calculations, in addition to producing graphs for a series of freely chosen TAGS.

The **MENU** consists of the following macro-functions:

- **PROCESSES**

  Metadata related to individual processes are entered following predefined rules regarding the product, sequence of equipment to be used, and dates of use. The entry of a process can be done with a **Guided Process procedure** or with a **Free Process**, where equipment can be entered in a sequence with temporal data without constraints.

  With the **Batch Status** procedure, the history of each ongoing or past process can be consulted, and data can be extracted equipment by equipment.

- **PROCESSES FROM SEQUENCES**

  If the sequence acquisition module is activated, a specific algorithm can automatically recognize the phases and dates of equipment usage, including CIP phases.

- **SEQUENCES**

  The procedure displays, analyzes, and extracts data related to intercepted/communicated sequences, being able to reconstruct the associations between sequences as per predefined algorithms. This analysis can be done by product, process, sequence type, and date. It is also possible to activate the possibility of correcting/inserting/deleting acquired or missing sequences.

- **PROCESS SAMPLES**

A procedure that collects metadata related to the results of analyses on samples taken during the processes, associating them with pre-existing metadata. Types of analyses, ranges, and other analysis data are part of an initial configuration.

- **GRAPHS**

Procedures for graphical analysis of processes allow producing graphs with a free selection among products, processes, equipment, TAGS, as well as predefined trends (combination of different TAGS), comparison with TARGET processes (golden batch), trends of calculated values, predefined dashboards etc., with the possibility of data extraction and graph printing.

- **BACKOFFICE**

Procedures for defining/inserting products, equipment, and TAGS by the authorized user.

- **UTILITIES**

Administrative procedures for correcting possible errors in process entry, procedures for checking data acquisition regularity, for testing notification functions (if the alarm/notification software is present), and procedures for importing data and metadata related to external analysis results.

- **SERVICE PROCEDURES**

Possible reopening of a closed process, modification of a process, etc.

EasyProcess Alarm_Control

The module aims to control the values assumed by a series of TAGS (sensors) and send alarms when they are outside certain ranges and error conditions occur. The value of each tag is acquired and archived with a sampling rate defined during installation. The software consists of 4 distinct packages: acquisition, consultation, monitoring, and simulation. The overall system includes all functions required for certification.

- **Acquisition**

Acquires the value of each TAG at predefined time intervals and archives it in a suitable database, via the proprietary El.Com.It OPC client. Acquisition also includes TAGs that indicate that the equipment is in the state to be controlled (control TAGs).

- **Consultation/Data Management and Notifications/Services**

Consists of a UI that allows the user to:

- Extract TAG data as files
- Obtain the trends of each tag in graphical form over chosen periods
- Consult the list of controlled TAGs with their specifications and log-file

With appropriate authorizations, it is also possible to modify user-functional parameters. Service procedures include various types of tests that can be activated by the user at any time.

- **Monitoring**

Monitoring activity occurs through control activated:

a) When one of the following conditions occurs:
   - A TAG, whose control has been enabled, assumes a value outside its set range.
   - Interruption or irregularity of sensor data acquisition
   - Problems accessing the database
   - The control is activated at the same frequency as sensor data sampling and sends notifications if the detected error has not been previously reported.

b) If a previously reported error persists. This control is activated at a frequency chosen by the user.

c) If an error is detected in one of the notification transmission systems. This function is activated at a frequency chosen by the user and allows periodically checking the actual functionality of alarm communication systems.

Notification methods include: e-mail, SMS, Whatsapp, and application.

Each control updates a log file with essential control data. The control of each TAG is carried out if enabled and if the corresponding control TAG is active.

- **Simulation**

This module allows activating a functioning mode that populates a database with simulated data according to various models and verifying that controls and notifications are functioning as specified.

Control Mode

For each TAG (sensor), 4 thresholds (LLA, LA, HA, HHA) of increasing value are defined.

A notification is generated each time the control detects an error condition, which can consist of:

a) System errors, such as failure to access the database or one of the tables used.
b) Acquisition errors; this type of error occurs if the time elapsed since the last acquired data exceeds the predefined acquisition period. In the case of controls that involve the use of 2 or more successively acquired data points, the software also checks that the data acquisition used is regular.
c) Quality errors: occur when the signal quality of the TAGs (sensors) or the enabling TAGs is insufficient (data reported as BAD by the OPC server).
d) Errors in the value of sensor data; these occur when:
    1. The software detects an inconsistency in the setting parameters.
    2. No values are present in the database for an enabled TAG (sensor) or its control TAG.
    3. The values of the TAG under examination fall outside the acceptance range according to the criterion selected during installation. The currently applicable criteria stipulate that a notification is sent when:
        - The latest instantaneous value of the TAG (sensor) is outside the LA-HA or LLA-HHA range, depending on the setting chosen during installation for each TAG.
        - The average of the latest values of the TAG falls outside the range; the number of values used for the average is defined in the setting.
        - The majority of the latest values fall outside the range. The number of values is defined in the setting.
        - The average is within limits, but the standard deviation exceeds the tolerance.
        - The weighted average of the latest values is outside the range.

Data and programs are organized so that the entire module can work independently and simultaneously on data from different departments.