

Release note for Lucullus PIMS 3.10.5 at Applikon

Date: August 24th 2021

The new Lucullus PIMS version 3.10.5 has been released. This last update has brought new functionalities with emphasis on quicker and simpler user experience. Please find a detailed description of Lucullus PIMS version 3.10.5 on the following pages.

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Redesign of Operation Tool

The Operation Tool received a makeover, simplifying its structure and usability. The different elements of the process control design follow a structured workflow like the one in the Planning tool. The new design allows users to have several operations opened in tabs in one Operation tool window. The permanently open *Operations* tab provides a space to organize and load operations.









Operations	00_Logger V1	01.02_Simulator2Logger V6	03_SimLoggerLPRAttr V1	04_SimLoggerLPRAttrOutType V1
 General	Name 00_Logger			
 Reactors	Type Master			
 Standard Devices	Created Fri Oct 25 2019			
 Custom Devices	State Active			
 Attributes	Abstract Simplest operation possible with empty Begin and Shutdown step			
 Step Chain	Description			
 Alarms				
 Finalize				

Figure 1: New design of the Operation Tool with a workflow (left) and tabs (top)

Definition of local process parameters

To complement globally defined attributes, LPIMS version 3.10.5 now allows the creation of operation-specific parameters. Those parameters can be defined in the Operation Tool with the same properties and functionalities as attributes defined in the System Administration Tool. Operation parameters are displayed together with the global attributes; however, they are grouped separately as Local Parameters. The Local Parameters folder will appear only for the processes that were run with an operation that contains local parameters in its design which is contrary to always available (even if empty) global attributes.

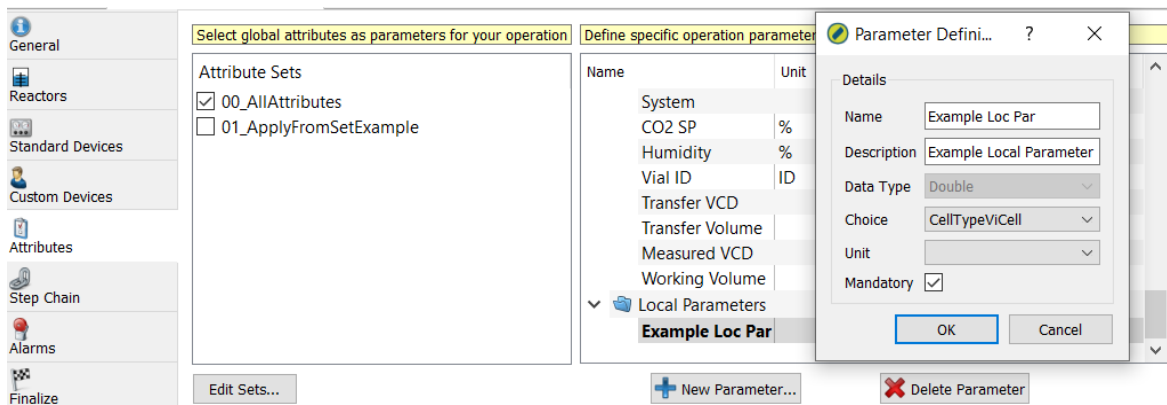


Figure 2: Selection of global and definition of new Local Parameters when creating a new operation.

Manual user interaction steps

A new type of step called Manual Step is introduced in Lucillus PIMS Step Chain functionality. Those manual interaction steps allow for the improved implementation of user interaction steps and enable better documentation of the process, especially when manual user activities are involved (see also new event format explained in section 8). Key characteristics of Manual Steps are:

- A flexible pop-up definition containing multiple elements of choice, value entry or comment
- Checklists in the form of free text to be confirmed by the user in a checkbox during the running process
- Direct value entry for Attributes or Ports with the display of description and range (both optional)
- Free text appearing in the pop-up as a message to the user with option of waiting (“snooze”) time
- Interactions can be flexibly defined as mandatory
- Clearly distinguishable (blue colour) in step chain to highlight steps required interaction
- Allowing mix usage and transitions between standard (“online”) and Manual Steps

- Replacement of Base- and Input-Consoles: Reduced programming effort and no more generic port definition (e.g. Input1-Input10)

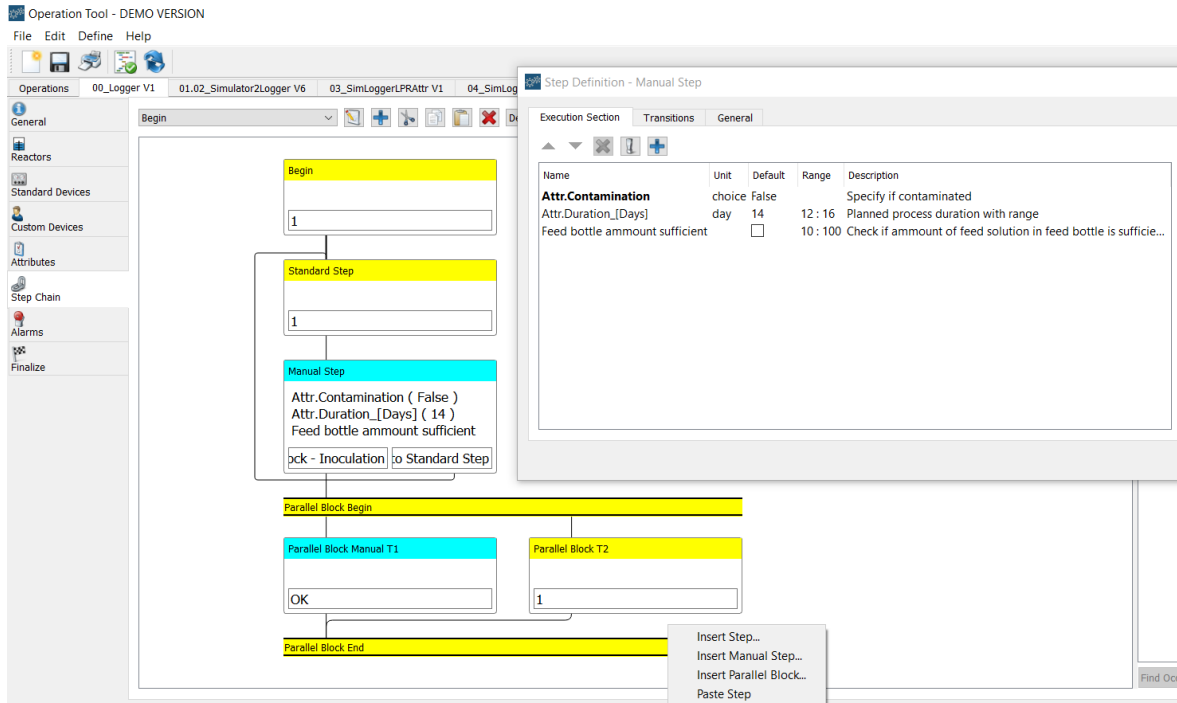


Figure 3: Graphical representation and definition of new Manual Steps (light blue). Step Execution Section with mandatory (bold) value entry and checklist options

The definition of required value entries is done in the same way as with standard steps (see Figure 3). The user selects a Port or an Attribute from the list of available resources and moves them to the Execution Section. Default value, unit, range and description can be defined subsequently. Checkbox items are added and defined with a click on the plus button. By toggling the exclamation mark button, items can be made mandatory (marked with bold). Those items will need to be filled by users before proceeding to the next step is possible.

In the transitions tab (unopened tab in Figure 3), four different choices of transitions per Manual Step can be defined to allow the user to control the course of process based on choices selected during the process run. Choices are implemented as text in the fields for the definition of the transition and connected to target steps in the same way as conditions would be connected to target steps with standard process steps

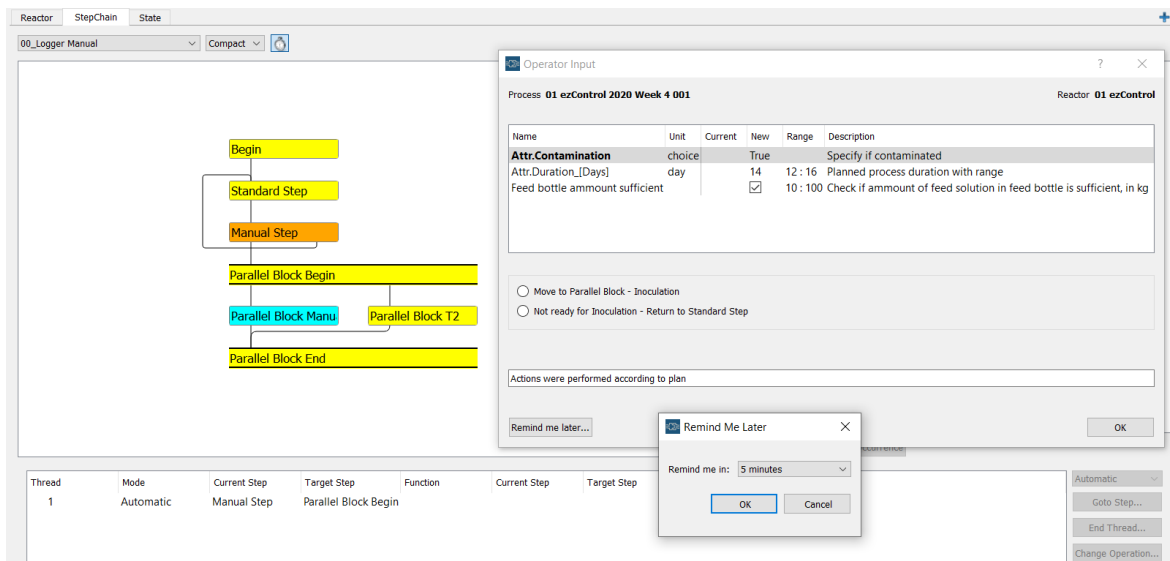


Figure 4: Manual Step pop-up window during execution.

The use of operations that contain Manual Steps is similar to the use of Base or Input Consoles before. Once a Manual Step is reached, a notification will be shown next to the running reactor on the left side (reactor panel). Clicking on it (or alternatively the Consoles button) will open the pop-up window with the defined elements and transition options. When opened, the operator can enter required information including some free text comment or decide to be reminded later about this step (“snooze”). If any of the items are defined as mandatory, they must be filled out before the operation allows user to proceed to the next step.

Step Chain improvements

Use of Attributes (Process Parameters) in Step Chains

Attributes can now be directly set within an Operation as a target for the assignment via the Output Types Copy Value, Execute Formula and as a target for the requested user input in a Manual Step.

In addition, attributes of string type can now be checked as a condition in the transition definition. Commands like Port name/Attribute name = “Organismus1” or Port name/Attribute name like “Org*” allow for equality or partial equality checks.

Direct calculation result assignment

Execute Formula is introduced as a new Output Type when defining a port or attribute in the Execution section. This enables a simpler definition of calculations within an operation without the need for the Calculator device and subsequent linkage of the result with a target port. Execute

Formula allows a direct definition of a port or attribute value. Calculations can be done once, i.e. exactly when the step is activated, or continuously (checkbox Continuous Calculation).

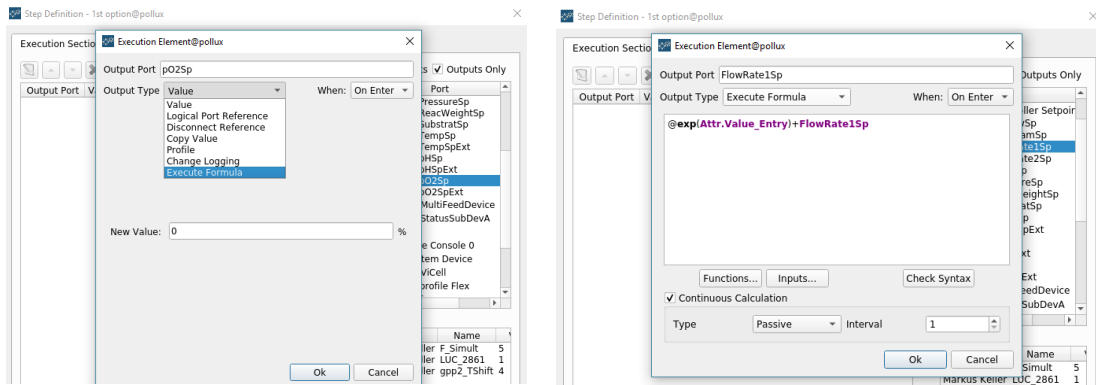


Figure 5: Example of Execute Formula functionality application

Increased number of parallel threads and transitions (target steps)

For parallel blocks, the new maximum number of parallel threads has increased from three to eight. The new maximum number of transitions per (standard or manual) step is four (previously three).

New Planning Workflow

The workflow tiles on the left side were optimized to simplify process planning. Process planning now starts with a *Schedule* overview of the planned process(es). Additional processes can be added or removed, rescheduled and their phases edited with direct representation in the calendar. Process phases can now be extended past the start or end of the process (non-monitored preparation or cleaning activities that block the equipment) and assigned with specific colours.

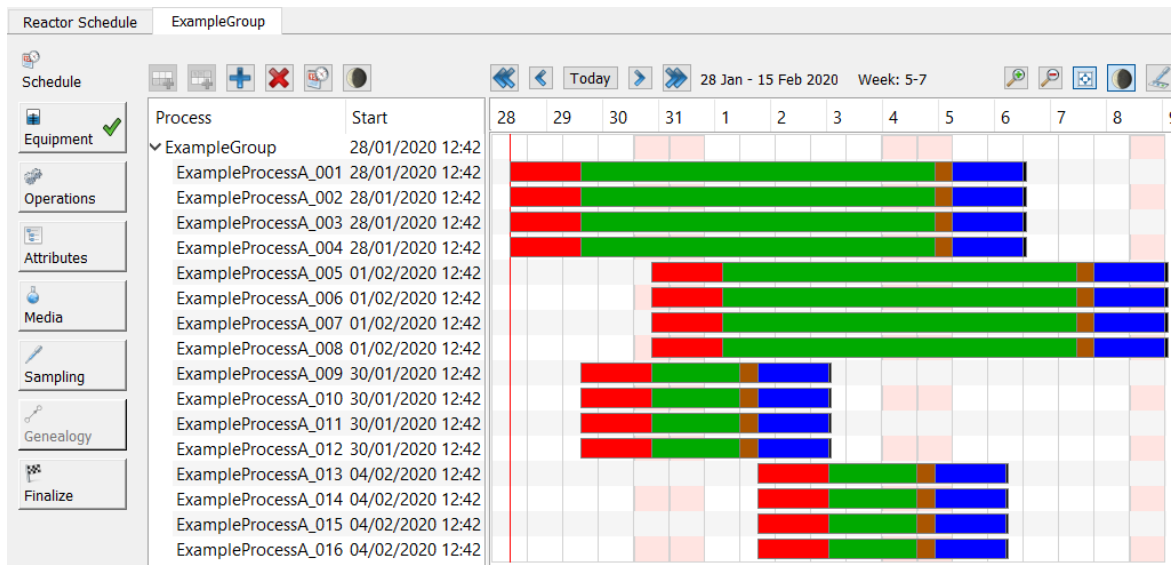


Figure 6: Redesigned workflow of the Planning Tool (left). In version 3.10.5, the calendar (right) acts as a central component for the planning (process creations/deletions, times, phases).

In the case of a (parallel) process group, the new tree structure contains just one top-level entity equal to the process group name (Figure 6: Example Group). In this case, this will result in comparable workflow steps as in previous Lucullus versions (selection of reactors, planning of parameters (attributes), selection of media and preparation of sampling lists).

The redesign, including the beforementioned tree structure, allows future expansion in the direction of campaigns (sequential and linked process groups). Lucullus next major release will allow to plan whole campaigns with mixes of offline processes (shake flasks) and online processes (reactors) to efficiently execute whole campaigns including transfer procedures into next stages.

Planning is completed in a final *Finalize* step in contrast to former versions in which the setting ready of the process group was confirmed by a workflow-independent button in the toolbar.

Execution Monitor replaces single-process Online Tool

Starting with version 3.6, the Execution Monitor for parallel process execution was first introduced as the “MR-Interface” with the goal to phase out the single-process Online Tool. Version 3.10.5 is now the first version without the former Online Tool. Processes will now be executed and monitored exclusively through Execution Monitor. As before, it is accessible via the *Online* tile in the main Lucullus PIMS framework.

The Execution Monitor now comes equipped with new Select Reactors and Processes window that is started as before with the *Select Reactors* button. This window provides users with several options to select and order the reactors and respective processes that are loaded in the Execution monitor.

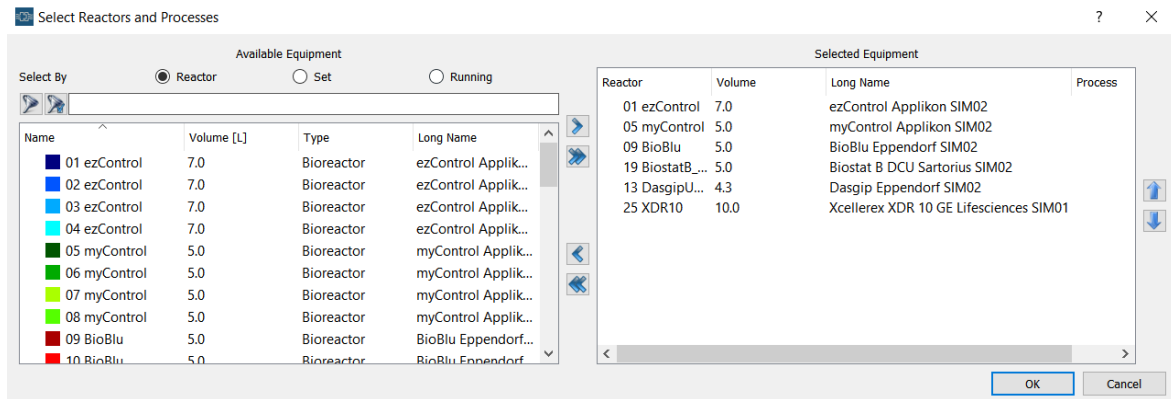


Figure 7: New Select Reactors and Processes window

Reporting and Event Format

Improvements in Graphic tool were made in regard to Event documentation and reporting in general. A new format type has been invented based on the process audit trail. The process audit trail can now be filtered based on various options (free text/substring, timestamps, event class, user) and the set of filters can be saved as a format.

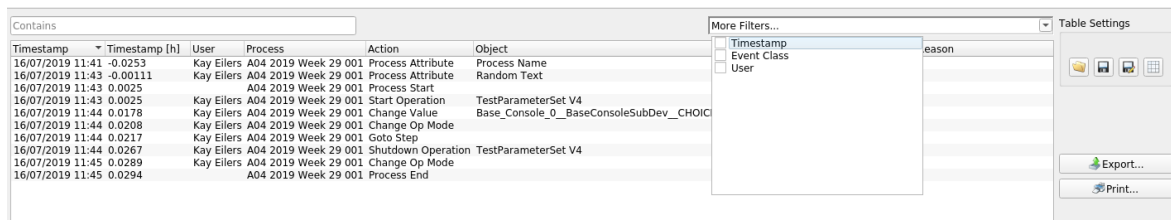


Figure 8: Event format window

This will allow to specifically create tables (also in reports) that show the interactions with a process in a most structured way. In combination with the manual interaction steps introduced above (see the section, the event format allows to extract detailed protocols around the processes.

The rendering engine was changed to LibreOffice to improve report generation robustness and proper formatting (e.g. formatting of tables and scaling of widths). Reports can now be created in different data resolutions which significantly increase report generation speed and prevent report generation failures.

System Administration tool changes

The System Administration tool has received few minor graphical and functionality changes. User, Reactor, Hardware and Process Phase configuration menus were graphically redesigned.

Lucillus PIMS features an in-built OPC UA Client including a browser to support connectivity to devices featuring an OPC UA Server.

A new Email Server Wizard is now available within System Administration tool which enables the easy setup of email notifications.

Additional hardware devices supported

The updated list of drivers available with the release of Lucillus version 3.10.5 contains the following new devices:

- BugLab BE2x00 & BE3x00 online biomass probes
- Diablo Analytical Diablo 5000B gas analyzer
- Gonotec Osmomat Auto
- Metrohm pH meter 780
- PBS Biotech Vertical Wheel™ bioreactor
- INFORS HT Shaker