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| FUNCTIONAL ANALYSIS  UNICOS-CPC (Continuous Process Control) | | |
| Alice TRD Purifier Modification  FUNCTIONAL ANALYSIS | | |
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HISTORY OF CHANGES

|  |  |  |  |
| --- | --- | --- | --- |
| REV. NO. | DATE | PAGES | DESCRIPTIONS OF THE CHANGES |
| 1.0 | 2015-08-20 | All | First Version (S. Pavis) |

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# INTRODUCTION

This document describes the modifications to be made to the TRD purifier to enable the expensive Xenon gas to be recuperated at the start of a regeneration sequence instead of being purged to the exhaust line. For the moment this will be a unique implementation on Alice TRD, but may be propagated to other purifiers in the future after testing and evaluation.

# REQUIREMENTS

## New I/O connections

*The valves YV2105 (column A) and YV2205 (column B) are not used as part of the process in the TRD purifier, so these valves will be re-piped towards a new vacuum pump instead of towards the exhaust line. The vacuum pump will be driven from a relay/relays connected to each of these valve outputs (i.e. no need for an additional output to drive the pump).*

## Change to State Logic

*The first state in the regeneration cycle “Purge Process Gas” is to be renamed “Evacuate Process Gas”. The actuators that are now driven in this state are shown in the table below with the changes (compared to a standard Purifier) highlighted for clarity. This table describes column A devices – column B s identical.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Device** | **Evacuate Process Gas (replaces “Purge Process Gas)** | **Heat Up through to Standby** | **Prepare for Run** | | | **Nominal Run** | **Comments** |
| Phase 1 part 1 | Phase 1 part 2 | Phase 2 |
| YV2107 | OFF/CLOSED | AS NORMAL | | | | | Column Main Outlet Valve |
| YV2103 | OFF/CLOSED | Column Main Inlet Valve |
| YV2110 | OFF/CLOSED | Column Purge Valve |
| YV2106 | OFF/CLOSED | Column Purge/Regeneration Inlet Valve |
| YV2104 | OFF/CLOSED | Column Purge/Regeneration Outlet Valve |
| YV2105 | ON/OPEN | OFF/  CLOSED | OFF/  CLOSED | OFF/  CLOSED | OFF/  CLOSED | OFF/  CLOSED | Process Gas Recuperation Valve (was “Prepare For Run (Phase 2)/ Purge Valve” – now re-piped towards new vacuum pump) |
| YV2111 | OFF/CLOSED | AS NORMAL | | | | | Regeneration Valve |
| TZ2101 | OFF | Heater |
| YV2102 | OFF | Water Cooling Valve |
| Pump2005 | OFF | Extraction Pump |
| Pump\_xxxx (New – driven from same output as YV2105 via relay) | ON | OFF | OFF | OFF | OFF | OFF | Process Gas Recuperation Pump (New) |

**Transition conditions**

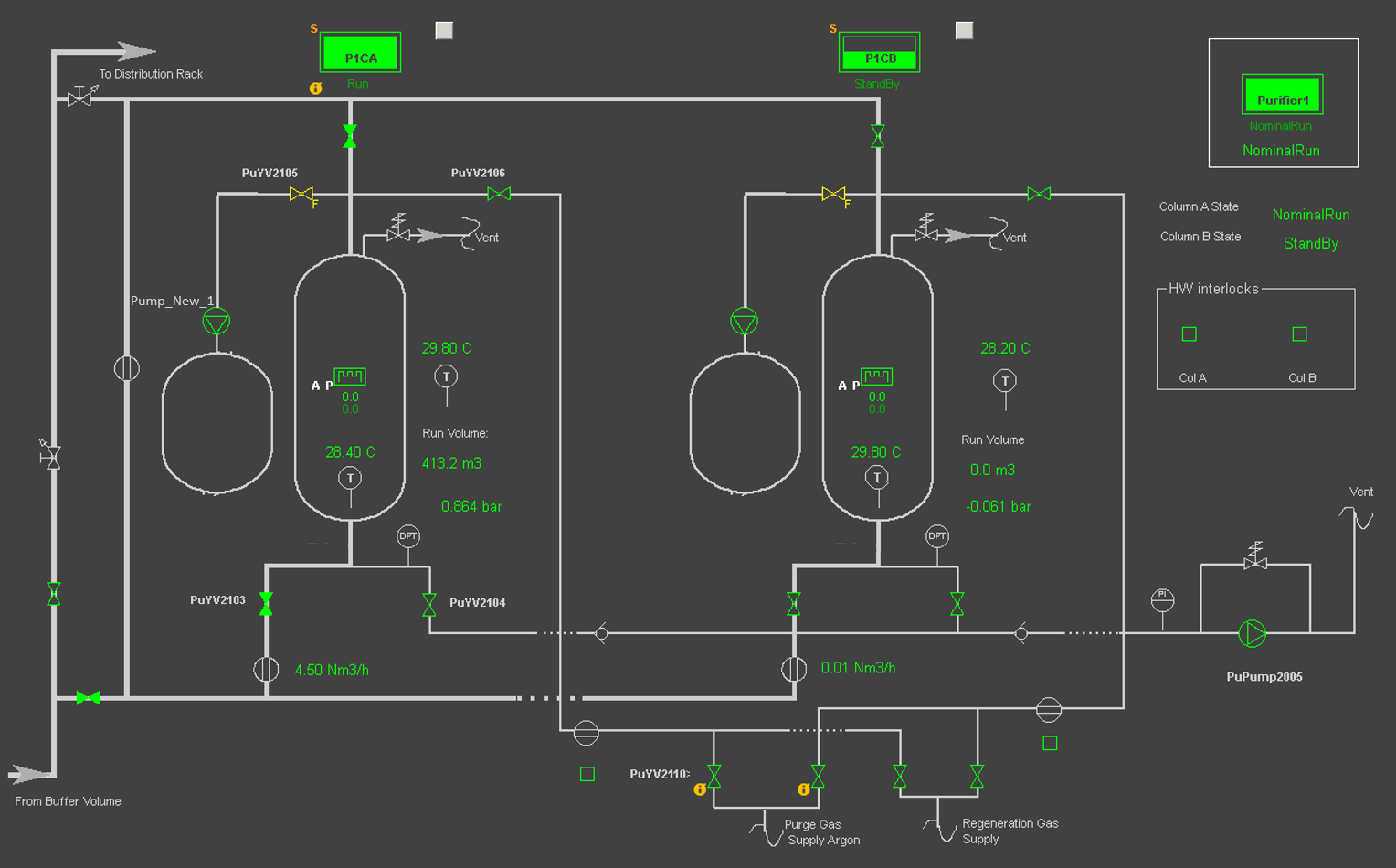
Transition from “Pre-saturated” to “regeneration” is the same as before (the Purge Process Gas state is renamed “Evacuate Process Gas”)

Transition from “Evacuate Process Gas” (previously named Purge Process Gas) to “Heat up” is a pressure event PT2108 <= -0.8 bar.

If this pressure event is not reached within time t (default 30 minutes) then the transition will occur (i.e. a timeout function). For minimum impact during this evaluation period, the pressure value and timeout values may be hard coded (i.e. no recipe parameters needed at this stage).

### Supervision

*The Purifier synoptic panels should be modified to show the change to the valve piping and the new pump. While the pump is not a new output from the control system, a pump symbol should be animated green at the same time as valve YV2105 and YV2205 (logically OR function).*

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