



P2.18 – Supercritical fluid extraction unit restoration

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ABSTRACT

The present work aims at the reassembling, new instruments incorporation, maintenance and performance tests in a supercritical fluid extraction pilot-unit that presented constant operational problems. The steps of layout redefinition, mechanical reassembly, electrical installation, implementation of a new process control system, equipment maintenance, instrument calibration, validation of the data acquisition system and operational tests were performed. The first activity consisted in evaluating the feasibility of using the original components, followed by mechanical reassembly and electrical reinstallation. Preventive maintenance of the new unit configuration, set up of pressure safety valves (PSV) and a sintered stainless steel filter, at the outlet of the extraction vessel, to prevent particles of the plant material from being carried. In order to improve the control performance and data acquisition of the process variables, the WEYNTEC HMI (human-machine interface) control system and the analog modules (TECNOLOG) were implemented. This new control system made it possible to activate the pilot-unit and evaluate its performance, the objective was to control the heating by the band heaters and the system pressure by a hydraulic diaphragm metering pump ORLITA (electric motor driven). The method utilized was a proportional integral (PI) control. A flow meter was set up and validated along with the optimization of control parameters for the unit. In order to validate the extraction unit, tests were carried out to extract caffeine from yerba-mate leaves under the following conditions: 300 bar, 60 °C, 950 g/h CO₂ flow rate, 2 mL/min ethanol flow rate, 200 g plant material and for 3 h of extraction. Experiments of yerba- mate decaffeination, reducing the caffeine concentration from 1.01% to 0.127%, proved that the strategy applied to the supercritical fluid extraction unit was successful, both in terms of its operation and in the data collection and storage of process variables.

Keywords: mechanical maintenance; control project; operational safety; electrical installation.