

The Innovation in Process Industries section of the European Commission's Industrial Technologies theme contrasts exploitative use of energy, raw materials and natural resources with a long term sustainable approach that considers the impact on future generations. The typical lifetime of an industrial process plant is between 30 and 50 years, which can be extended if economically, justified by successful maintenance and overhauls. Technologies that can enhance the operation of process plants can both guide the development of new state-of-the-art process plants and, perhaps more pertinently, ensure that the large installed base of existing plants operates efficiently and competitively. They enable a better control over the lifetime of the plant by more sustainable operation. Moreover, process condition monitoring is of importance for better scheduling of maintenance activities and long-term optimization.

That is why effective monitoring and diagnostics of process control installations is of utmost importance. Algorithms for fault detection and isolation allow extension of system life, reduction in operation interruption and can lead to significant economic savings. The main difficulty in their development is that process installations even in nominal state have a high level of complexity, are usually nonlinear and influenced by stochastic disturbances and parameter variations. Therefore, models based on first principles are difficult or even impossible to use on a wider scale. That is why statistical modeling approaches are the leading methods currently researched. However they are based on classical results, which have significant problems with non representative data, which are general problem of fault diagnosis. In this project new methodology based on Bayesian statistics and functional data analysis is proposed. Proposed methods will be able to address the shortcomings of currently used approaches, by:

- incorporation of expert knowledge to diagnostic systems,
- handling of non representative and incomplete data,
- combining aspects of fault detection, degradation modelling and downtime predictions.

Obtained results will be tested on experimental data from full scale and laboratory process systems.