

HIPCON Public summary progress report M12-M24



Introduction

The HIPCON project is a 6th framework NMP priority STREP with contract number 505467-1 with 3 years duration from January 2004 to December 2006.

Process industries in today's highly competitive global market must reconsider their production control policies and strategies if they are to achieve sustainable production and increase their competitiveness. In order to attain sustainable and economically efficient production, it is necessary to take a holistic view of process control and management. This can only be accomplished by integrating consideration of product quality, process economy and environmental impact in the next generation process control and optimisation systems.

Objectives

The HIPCON project aims at developing methodology and technology to facilitate transformation of the European industry to adapting holistic process management from a life-cycle perspective. In order to demonstrate the results and measure advantages a prototype software platform for multi-objective optimisation and control will be developed. In the end of the project the system will be implemented and demonstrated at the two case study industries.

The HIPCON project aims at developing methodology and technology for holistic process management from a life-cycle perspective. The project results will support long-term transformation of European industry and promote increased competitiveness and eco-efficiency of the industries. The specific aims of HIPCON are to:

- Develop new parameters for economic and environmental impact of the processes on company and societal level.
- Develop process control and modelling methods for industrial production processes covering product quality, economic and environmental impact of the processes.
- Integrate performance indicators from different disciplines for holistic process management.
- Identify conceptual models and control objectives for the industrial cases. Successful modelling for all industrial cases, linking process status together with economical, environmental and quality performance.
- Produce prototype computer code integrating mathematical models from different disciplines and control strategies for development of a holistic process management system
- Estimate performance improvements from a holistic viewpoint in all industrial cases.
- Disseminate the scientific results through scientific publications and conference presentations.
- Disseminate the results to relevant European industrial sectors through industrial take-up activities such as an industrial reference group, company visits and industrial seminars.

Progress

This report describes the progress during the second year of the three year HIPCON project. In the steel plant case study the HIPCON project will mainly focus on the steel making part of the process, e.g. the so-called LD converter process. A key objective is to reduce and predict slopping in the LD converter which is of relevance both economically and environmentally. In the WWTP the focus will be on chemical precipitation and the activated sludge process. One objective, among others, is to optimise the addition of precipitation chemicals, i.e. to minimise the dosage while maintain a high quality on the effluent and a stable process.

Environmental and economical modelling of the case studies started with development of KPI libraries capturing important aspects of the process' performance for each case study application. Economic modelling work is mainly based on cost modelling but work has also been devoted to establishing methods for indicating the economic risk of modifying the industrial process being monitored. Environmental modelling work is based on life-cycle inventories (LCI). Both economic and environmental modelling work in the project is near completion. The models will be used for monitoring process performance and in combination with simulation models for process performance simulation and optimisation.

Process modelling work is progressing in several parallel tracks, aiming at process diagnostics, soft sensing and process simulation. Both empirical (multivariate statistics, artificial neural networks etc.), semi-physical (grey-box) and physical approaches are being used.

In the wastewater treatment case, soft sensor models have been developed that can be used in feed-forward control of the processes and simulation models that can be used for scenario based reasoning and optimisation. In the steel plant case study, modelling methods have been successfully used to develop a dose optimisation strategy can save large amounts of reagent if implemented in the plant, which leads to decreased environmental impact and lower operating costs. Several useful diagnostic models have also developed for the LD converter process.

The work on process control methods and strategies has proceeded along different tracks, incorporating economical and environmental considerations. Several novel control strategies for both case studies are being evaluated using simulation models and historical plant data.

One project objective is the development of prototype computer code integrating mathematical models from different disciplines in a holistic process management system. A prototype with most of the functionality of the final software product has been developed during 2005. It has functionality for monitoring, simulating and optimising the process performance from environmental, economic and quality perspective.

During the first year, an Industrial Reference Group (IRG) was established by recruiting members from relevant industries. The group currently consists of representatives from 12 large companies from various industrial fields with a geographical spread over Europe. The consortium will use the IRG as an advisory agent that will feed back on use of the HIPCON results from an industrial point of view.

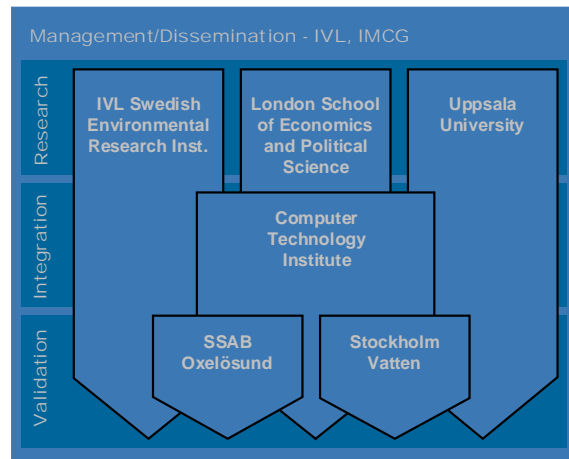
Contact information

Visit the project web site www.hipcon.org for up-to date information about the project. For further information, contact the project manager at IVL, Jonas Röttorp (jonas.rottorp@ivl.se , +46-8-59856300)

The HIPCON consortium

The development of the holistic process management system requires close co-operation among experts in a variety of fields, e.g. economic, environmental and process modelling, multi-objective optimisation and model based control theory. Integration of the research is of paramount importance.

The consortium consists of 5 partners with expertise in these areas and two case study industries. Contact details and expertise of the partners are given below and the main roles of the partners in the figure.



IVL Swedish Environmental Research Institute, co-ordinator

IVL is Sweden's leading organisation for environmental research. In HIPCON, IVL works primarily with project management, environmental modelling and process modelling.



London School of Economics and Political Science

The activities of London School of Economics and Political Science in HIPCON are in the fields of econometrics and statistics.



Uppsala University, Division of Systems and Control

The division does research in such areas as system identification, signal processing, fault detection and automatic control. UU is responsible for model based control.



Computer Technology Institute (CTI)

CTI specialises in applied research related to computer science. In HIPCON, CTI works with decision support systems and is responsible for integration and implementation.



IMCG Ltd

IMCG is an international management consulting company based in London. IMCG works with dissemination and commercialisation of the project results.



SSAB Oxelösund AB

SSAB is one of the medium-sized steel companies in Western Europe. The steel production facility in Oxelösund is one of the case studies in the project.



Stockholm Vatten AB

Stockholm Vatten produces drinking water and manages and treats wastewater from Stockholm and neighbouring municipalities. One of the company's wastewater treatment plants is a case study in HIPCON.