1. Introduction

DISIRE Impact on the mining industry

The DISIRE project aims at developing and introducing novel inline measurement techniques that will enable a significant transition of the current state of the art existing control and monitoring systems, from a static sensing and control in multiple parallel loops perspective, into a product based, online, and in-situ process, reconfiguration of the IPC strategies based on extended online and near to real time PAT analysis of a vast stream of data from the internal process dynamics.

In the specific case of KGHM, the DISIRE technological platform will enable the e-pellet based tracing of the ore in the belt conveyor system and continuous fault detection in the transportation system which will result in decrease of energy consumption of flotation processes and increase the copper recovery due to the better adjustment of process parameters which is enabled by the identification of incoming ore by pellets (Figure 1).

Figure 1 Application of the DISIRE concept in a.u. the pelletizing process

The DISIRE PAT will help to identify and mark the chosen parameters of exploited and transported copper ore and – due to use of the PAT-based information for control of flow of the ore of a given quality – to reduce the idle work of belt conveyor. This will facilitate improvement of transport efficiency, energy consumption reduction, development of new sensors, algorithms and strategies for large, spatial transportation system. Furthermore the outcomes of the DISIRE project can be applied in any industry where large belt conveyor systems are used for transporting bulk material whose variable parameters should be identified and recorded for the needs of further processing. Some examples are: Large lignite surface mines and mine-mouth power plants, Coal mines, Bulk material depots in harbors, Food industry (transportation of cereals, feeding stuff).
Overview of the Polish mining industry

Poland is the second largest economy in Central Europe and the sixth largest amongst the European Union’s member states. The country has the eight-largest global reserves of copper at 28Mt and ranks 12th at copper production in the world. All of Poland’s copper production comes from KGHM Polska Miedź (Polish Copper) S.A. which produces approximately 560 000t of refined copper and 1 100t of silver each year. In the recent years Poland’s mining industry has faced a number of challenges in terms of production capacities however, there have been signs of recovery, with the country’s silver, zinc and copper production showing an increase over previous years. In addition to external economic conditions, the effectiveness of the conducted mining operations depends on the quality of the deposits owned and the related extraction costs. In this respect mining costs in Europe are very high due to high prices of labor and energy and extremely high surface costs. High prices of labor have to be addressed with high level of automation of industrial processes in order to reduce the need of human work while high prices of energy put the energy-efficiency of technological processes into the constant concern of mining management which usually is treated as a top priority policy. Therefore DISIRE technological platform containing Process Analyzer Technology (PAT) of Industrial Process Control (IPC) and proposed improvements of belt conveyors systems design and maintenance are the proper solutions addressing high mining costs of European/Polish mining industry as well as productivity and quality control issues.

2. Polish Partners

KGHM Polska Miedź (KGHM)

KGHM Polska Miedź is a world leader in the extraction and processing of valuable natural resources such as copper and silver. The company controls over 37.5 million tons of copper ore resources worldwide including the largest European deposits of copper ore located in the south-western part of Poland right in the heart of its catchment area. With over 50 years of experience in the mining industry KGHM has built a reputation of a reliable producer, a trusted business partner and a company with a sustainable development policy. The role of KGHM in DISIRE Project is to identify the key factors that need to be considered from automatic control perspective about the process of transporting the copper ore from the mining face to the processing plant in the unground mines. The company will execute investigations of the resistance to motion of the belt conveyor with regard to various operating conditions in the mine as well as play a key role in the integration of available information from different sources for the design, development and demonstration of a comprehensive model of the system.

Key Facts

- Founded in 1961. Formerly – the Polish State Mining and Metallurgical Combine
- Controls 4% (37.7 million tons) of global copper ore reserves
- Operates on three continents – Europe, North and South America
- Head office is located in Lubin, Poland
- Employs 34,000 people worldwide
- Member of the prestigious RESPECT index published by the Warsaw Stock Exchange
- Metals produced: copper, precious metals (silver and gold), molybdenum, rhenium, and other products (refined lead, sulphuric acid, copper sulphate, nickel sulphate and technical selenium which are products that KGHM obtains during copper ore processing operations.)

More information:
http://kghm.com/en
KGHM Cuprum (CUP)

KGHM Cuprum is one of daughter companies of KGHM Group responsible for research, development and innovation in mining industry mostly focused on underground copper mines belonging to KGHM. CUP has significant experience in conducting high value research and undertaking industrial R&D projects. CUP has been involved in large European and National projects various academic and industrial partners both in Poland and Europe.

Key Facts

- Established in 1967 as part of the Copper Mining and Metallurgical Complex in Lubin.
- Range of activity - technological research in geology and hydrogeology, mining, rock-mass mechanics, mine ventilation, automation, electrification and mechanisation, ore processing, tailings disposal, surveying and environmental protection.
- Fields of operation - all service areas linked with mining activity, from project evaluation, through research and development, to project management and supervision of the implementation stage.

The contribution of KGHM Cuprum in the DISIRE project is based on their extensive expertise in the fields of mechanical and electrical engineering, systems analysis and process management development.

More information:
http://www.cuprum.wroc.pl/

Wroclaw University of Technology (WRUT)

Wroclaw University of Technology (WRUT) is a public institution which was founded in 1945, but its academic legacy dates back over 160 years to the Lviv University. WRUT belongs to the best technical universities in Poland. The mission of the university is to shape the creative and critical personalities of students and define the directions of development in science and technology.

Key Facts

- Highly qualified team of 200 multidisciplinary professionals
- Completed 1094 research, development and innovation projects in the field of energy
- Trained 1853 students from 47 different countries
- Owns and manages 11 laboratories equipped with the latest technologies
- Operates within the following sectors and markets: energy, buildings and construction, IT, automotive, transport and logistics, industry, agro alimentation, environment, aeronautics, commerce and tourism.

The participation of the Wroclaw University will be disseminated among all the technological work packages (WP) of DISIRE. In particular, WRUT will participate in the specification of the demonstration and evaluation test cases, with a direct focus on the processes connected to KGHM. WRUT will also participate in the WPs for the development of process modelling and control, sensors and electronics and data mining and will try to adapt the activities in these WPs towards the application of raw material transferring in the mining sector. Moreover, Wroclaw University of Technology will participate in the demonstration of the DISIRE concept in WP5 and in the dissemination activities in WP9.

More information:
3. News & Events

**News**

**DISIRE Project deliverables**

**Interactive Innovation Toolkit (IIT)**

An online-based Interactive Innovation Toolkit (IIT) was designed to provide guidance and support to various interdisciplinary stakeholder groups within the DISIRE project. It aims to unlock the innovation potential of the DISIRE technological platform and to reinforce its impact. The motivation behind the IIT is to foster collaboration between the partners, enabling them to bridge the gap between project ideas and concepts and real business cases in the cross-sectorial context. The easily accessible, efficient and interactive framework of innovation tools and techniques supports DISIRE partners in their innovation and exploitation activities and helps them to think beyond standardized product development algorithms.

Access the tool here:
http://spire2030.eu/disire/
http://iit.moez.fraunhofer.de/

**Events**

**2nd consortium meeting of the DISIRE in Tarragona, Spain**

The 2nd consortium meeting of the European project DISIRE took place on 8th - 9th of September in Tarragona, Spain and was hosted by Dow Chemical Ibérica. The meeting aimed to establish a successful strategy for the knowledge and data transfer between the DISIRE partners and to discuss the current and future technical and research objectives in the fields of modeling, sensing, IPC as well as industrial application and demonstration. Several consortium partners, including LTU, IMT Lucca, WRUT, DCI, CIRCE, CUP, KGHM, Electro-tech, GSTAT and D’Appolonia, reported on recent contributions to the technical work packages and provided an outlook on the next steps. The productive dialogue between the research organizations, industrial partners and technology providers resulted in a better alignment of the technical requirements for developing process models and IPC strategies based on data analysis and in situ sensing.

More information:
1st DISIRE Industrial meeting at KGHM Poland

The 1st meeting of project DISIRE dedicated to assessing the specific technology requirements of the industrial partner KGHM Polska Miedź took place on 11th - 13th of October in the cultural capital of Europe for the year 2016 – Wroclaw, Poland.

The purpose of the meeting was to initiate a deeper dialogue between the leading partners of the technical work packages and the industrial partner KGHM which is also responsible for the demonstration activities within the project. The meeting started with two parallel tracks. In the first track, the partners from KGHM Polska Miedź, Fraunhofer Center for International Management and Knowledge Economy, LTU and WRUT (Politechnika Wrocławska), engaged in a discussion to identify the business cases, value propositions and impacts of the DISIRE technology on the existing processes in the mining industry. In the second track, the experts from ABB, Electrotech, G-Stat and LTU visited one of the mines in the metallurgic complex of KGHM Polska Miedź in order to gain deeper understanding of the processes and technology for transportation of the ore that is currently being used. The meeting continued with a technical discussion on data analytics and a visit to the processing plant where the DISIRE team had the opportunity to study the flotation process.

On the 6th of May 2015 the Kick-off meeting of WP8 (Combustion Processes Improvement) took place in the Dow Tarragona Ethylene Cracker premises. DISIRE representatives of DCI and CIRCE participated in the meeting with a special focus on how to address the sub-tasks 8.1 and 8.2 of this WP, putting special emphasis in the topics of defining the conditions for flue gases monitoring and measurement in a cracking furnace through CFD (Computational Fluid Dynamics) and in developing a protocol to implement the on-line of the non-invasive techniques of imaging diagnosis.

The first DISIRE industrial meeting continued on the premises of KGHM Cuprum and Wroclaw University of Technology with further technical discussions and networking activities where the partners had the opportunity to discuss the sensors and interact with representatives from KGHM in order to define best practices for maximizing the impact of the technology.

As a result of the fruitful discussions during the two day meeting, the consortium partners decided to lunch an experimental campaign for tracing the ore using some of the modules of DISIRE technological platform.
Upcoming conferences, workshops and exhibitions

November 2015
- The 2015 Australian Control Conference - AUCC2015 / Australia, 05.11.- 06.11.2015
- 41st Annual Conference of the IEEE Industrial Electronics Society / Yokohama, Japan 09.11.-12.11.2015
- Specialized Exhibition for Equipment and Technologies for Process Automation and Embedded Control Systems / Ekaterinburg, Russia 17.11.-19.11.2015
- SPS/IPC/DRIVES / Nuremberg, Germany 24.11.- 26.11.2015

December 2015
- Tech Industry Int'l Exhibition of materials and technologies for industrial production, mechanical engineering, metalworking, automation, electronics / Riga, Latvia 03.12.- 05.12.2015

January 2016
- 2nd Indian Control Conference / India 04.01.- 06.01.2016

March 2016
- Int'l Fair for Industrial Automation / Warsaw, Poland 01.03.-04.03.2016
- SIAF Guangzhou 2016, SPS - Industrial Automation Fair Guangzhou / China 08.03. - 10.03.2016
- CIRE 2016 - The 5th China, International Industry Robotic Exhibition / 08.03. - 10.03.2016
- Control-Stom (Fair of Industrial Measuring Technology) / Kielce, Poland 09.03 - 11.03.2016
- IEEE International Conference on Industrial Technology / Taipei, Taiwan 14.03. – 17.03.2016
- EAI International Conference on Industrial IoT Technologies and Applications / Guangzhou, China 24.03.-26.03.2016

April 2016
- 14th International Workshop on Advanced Motion Control / Auckland, New Zealand 22.04. – 24.04.2016

May 2016
- 12th IEEE World Conference on Factory Communication Systems / Aveiro, Portugal 03.05. – 06.05.2016
- AchemAsia 2016 / Beijing, PR China 09.05. - 12.05.2016
- Elmia Automation / Joenkoeping, Sweden 10.05.-13.05.2016

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