INSPIRE WATER NEWS

INNOVATIVE SOLUTIONS IN THE PROCESS INDUSTRY FOR NEXT GENERATION RESOURCE EFFICIENT WATER MANAGEMENT

ISSUE 01/2017

EDITORIAL

We would like to welcome you to the 1st issue of our INSPIREWATER newsletter. The INSPIREWATER newsletter will provide you with current information on the project progress, especially at its demo sites and its technologies and it gives an overview on the activities within INSPIREWATER.

It has been a year since INSPIREWATER started. A lot of things have happened and a lot of work has been carried out since then. INSPIREWATER is an application-oriented project that needs a strong input from the global companies, SME's and research institutions to reach solutions in the process industry for next generation resource efficient water management – in order to support the reduction of water use, raw materials, chemicals, save energy and reduce waste and wastewater discharge. Our newsletters will have a "series on the INSPIREWATER demo sites" where descriptions and actual actions of the sites are presented. This issue presents the demo site ArcelorMittal in Gijón, Spain. It gives a good insight in how strong the partners in INSPIREWATER work together.

Now, enjoy the newsletter. Please visit the website in order to learn more about INSPIREWATER in general, and to get detailed information on upcoming events – **www.inspirewater.eu**.

Your INSPIREWATER Team

INSPIREWATER Consortium at the Kick-off meeting in Brussels, Belgium (Photo: IVL).

INSPIREWATER in Brief

INSPIREWATER (Innovative Solutions in the Process Industry for next generation Resource Efficient Water management) is a Horizon 2020 project funded by the European Commission.

The main objective of the project is to demonstrate solutions that **increase water and raw material efficiency in the process industry.**

The project aims to:

- Increase water and resource efficiency by 20-30% in the process industry.
- Use new and established resource-efficient technologies, to **reduce water consumption, energy, use of chemicals and to reduce waste.**
- This will be underpinned by a holistic **water management framework** which will complement existing management structures in **process industry** companies.
- The holistic framework and individual technologies having been proven and integrated, it is crucial to the success of the project that INSPIREWATER's work is widely disseminated and exploited by industry to guarantee maximum uptake and impact.

Within the field of these topics, **new and established technologies** will be tested and demonstrated. For demonstration, 3 sites are involved, 2 in **Spain** and 1 in **Sweden**.

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Project coordination:
IVL Swedish Environmental Research Institute

Project Duration: 01.10.2016 – 31.03.2020

Project Consortium: ArcelorMittal, Blue-tech, Clariant, DECHEMA e.V, Dow Chemicals, FHNW Fachhochschule Nordwestschweiz, IMCG Innovation Management Consulting Group, IVL, MOL Katalysatorentechnik, Sandvik, VDEh Betriebsforschungsinstitut

Project Website: www.inspirewater.eu

Demonstration site at ArcelorMittal in Gijón, Spain

INSPIREWATER partners involved

ArcelorMittal is the world's leading steel and mining company. Guided by a philosophy to produce safe, sustainable steel, it is the leading supplier of quality steel products in all major markets including automotive, construction, household appliances, and packaging. ArcelorMittal is present in 60 countries and has an industrial footprint in 18 countries. ArcelorMittal R&D Department is devoted to many developments and improvements in the framework (AMI_3) of the steel and mining business. The team involved in this project is mainly devoted to achieve sustainable water treatment solutions and water management optimization.

BFI is a research institute focused on the process industry with an extensive network on an international scale. BFI has skills and expertise to build and lead powerful consortiums and to tackle new research topics together with partners in the process industry. BFI is specially linked with the steel industry. BFI addresses emerging issues of major relevance in areas such as energy efficiency, process optimization, industry 4.0 and measuring and instrumentation technology.

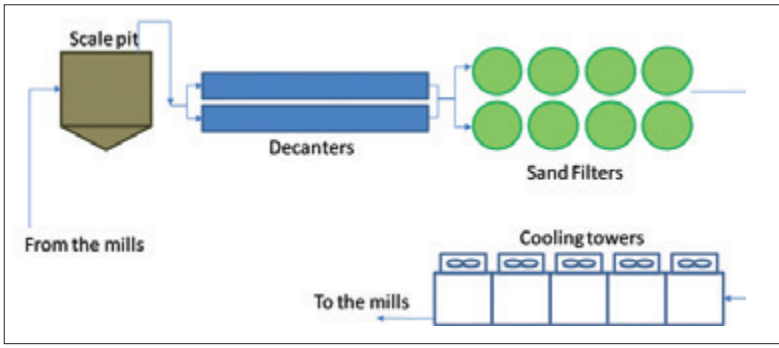
Introduction of the site

ArcelorMittal Rail Mill Gijón (site chosen for INSPIREWATER trials) has been provided with a cooling water circuit, which is fed with treated water provided from the water treatment plant, called the Heavy Plate Water Treatment Plant (WTP). Once the water enters the Rail Mill cooling system (~2000 m³/h), it is distributed in different cooling circuits and then returns to the WTP to be treated.

Demo objectives

BFI and AMI_3 will demonstrate the combination of chemical free particle removal with pilot plants (strong field magnetic separation and different media for filtration) in comparison with operational used sand filtration in the WTP (industrial sand filters). BFI and AMI_3 will also demonstrate the removal of dissolved salts and their related problems via an innovative electroprecipitation reactor in comparison to reverse osmosis. The demonstration of this innovative electroprecipitator will take place in one of the close-loop cooling water circuits of the Rail Mill.

Configuration of the WTP is described in the following scheme:



Scheme of the water treatment plant

WTP industrial sand filters (Photos: AcelorMittal)

Pilot plant for different media filtration (Photo: AcelorMittal)

Innovative precipitation reactor (Photo: AcelorMittal)

Current state of demo trials

During the last months, site preparation has been carried out for implementing all the units for demonstration: selection of pilot plants connection points, input water supply and out water discharge, energy supply, compressed air, space demand and handling of by-products.

In September all parts of the pilot plant will be installed: magnetic separator (BFI) and media filtration (AMI3) units will be implemented at WTP, and innovative precipitation reactor (AMI3) at one of the cooling water circuits in the Rail Mill. Subsequently, all the implemented units will be commissioned.

New technology developments in demo trials – BFI strong field magnetic separator

BFI has developed a magnetic separator for a flow rate of 50 m^3/h allowing a chemical free and energy saving separation of magnetic particles. The magnetic separator will be operated in demo trials at ArcelorMittal Gijón site starting in September 2017. Focus of the demonstration is the investigation of:

- the long term behaviour of the magnetic separator in treating abrasive solid,
- the influence of organics such as oil or fat and the dissolved salts containing in the cooling water.

Considering the promising lab trial results with cooling water samples, high removal efficiency in combination with a high concentrating of the particles leading to low cleaning sludge amounts can be expected.

Base for high removal efficiencies is the optimized positioning of the magnets considering the particle properties. This positioning was determined in investigations of the behavior of the magnetic field, simulations of the magnet set up and evaluation of simulation results in magnetic separators with the flow rates 0.5 m^3/h and 5 m^3/h. Further on, the developed configuration allows a constant outlet solid content after the magnetic separator even in the case of strong varying inlet solid contents e.g. by the factor of 10.

A further advantage is the achievement of high concentration factors up to 1000 (=ratio of solid content inlet magnetic separator/ solid content produced sludge) compared to sand filters with concentration factors of 10–20. As a result the back flush water volume of the magnetic separator is with 0.06% of the treated flow much lower compared to 3-5% at discontinuous sand filtration, leading to lower sludge dewatering efforts like investment costs e.g. for decanter centrifuges, operational costs for polymer or energy.

The energy saving consists of the pressureless operation of the magnetic separator compared to discontinuous sand filter requiring a pressure of 4 bar, leading to a high pump energy demand.

The magnetic separator with a flow rate of 50 m^3/h has a compact design (1.5 m x 1.9 m x 3.2 m) and no contact of moving parts with cooling water avoiding wear of clogging. The strong field magnet separator consists of a tank with a weir containing three lines of shifted arranged magnets and two movable nozzle bars at the inlet and outlet side of the magnets. The cleaning process is about maximum 5 minutes from stopping the feed pump, emptying the tank, moving out of the magnet by a hydraulic pump, cleaning, moving in of the magnets and restart. A side window allows an optical process control.

Strong field magnetic separator (Photo: BFI)

Particles and sludge attached to the magnetic separator (Photo: BFI)

MOLKAT: catalyst technology for optimizing water reuse in chemical industry

Since 1995 MOLKAT is active on the field of heterogeneous catalysis. The novel and highly advanced technologies for water treatment developed by MOLKAT combine energy-efficiency with eco-friendly approaches. The metal catalyst reduces the scaling potential and deposits on downstream surfaces. As a result, the system performance is rising. The so called MOL®LIK technology allows biocide-free water treatment.

For over 15 years – MOL-Technology has proven to be highly reliable, efficient & cost effective. The smallest applications you´ll find at agriculture as well as domestic applications – the hugest ones are power plants, refineries and industrial RO-systems.

Cooling Applications

Membrane Systems

Storage Tanks

Process Water

Humidifiers

In cooling water circuits, the energy transfer is a result of warming and partial evaporation of water. This is accompanied by temporary changes of water structures, which influences the chemical potential of the entire system combined with precipitation reactions and scaling effects.

On the surface of special MOL-catalysts, it is possible to restore the natural state of equilibrium in water much faster. This results in:

- Markedly improved chemical efficiency
- Minimized maintenance efforts
- Increased plant performance

Based on the long-term experience at cooling systems, MOL®LIK modules are also used for increasing the performance at membrane applications. At the pressure side, only the smallest pieces of water are able in slipping through the membranes. The installation of a MOL®LIK-catalyst is speeding up this process achieving the thermodynamic equilibrium between water structures for minimising issues with deposits. As a result, the water can easier pass through membranes. The INSPIREWATER project will test possibilities of this technology at membrane systems with challenging makeup water in the area of effluent reuse at the Clariant demonstration site in Tarragona, Spain.

Catalyst module with integrated LED-unit (visible light beam)
(Photo: MOL Katalysatortechnik)

Upcoming events for getting in touch with possibilities of MOLKAT

- **IFAT in Munich/Germany**
  14th May till 18th May 2018

Development in INSPIREWATER: Holistic Water Management

One of the main goals of the INSPIREWATER project is to support efficient water management in companies by developing and demonstrating a water management structure coupled to company management structures.

Within INSPIREWATER, we will develop a holistic water management system (WMS). The background is that water is becoming increasingly important for many industrial sectors and locations due to increased water stress. Regions which traditionally have had little or no restrictions on process water now see that they need to reduce fresh water uptake and they also need to increase treatment of used water before it leaves the premises. Therefore, the need for water management systems to monitor and optimize water use is increasing. Such management systems also complement development of technological solutions and facilitate their implementation.

The INSPIREWATER approach will demonstrate how a generic framework for process industries can be used for a holistic approach for efficient water management, including life-cycle thinking and resource efficiency key performance indicators. The water management has various dimensions starting from measures directly linked to single production processes up to measures and cooperation that go beyond one industrial unit or site. The number of actors to be involved is growing with the scale and could be other industrial sites, municipal wastewater treatment units, water resources management institutions. The aim of INSPIREWATER is to develop a WMS that is considering these aspects in an integrated way and is applicable to many types of industrial sectors, requiring only minor adjustments for each type of site. The idea is also to be compatible with existing solutions for company and production management. This will be tested and demonstrated in case studies during the project.

Upcoming Events

INSPIREWATER Workshop (time and place to be announced)

Two workshops will be organized to facilitate and bring forward the exchange of knowledge and results in a cross-sectoral way. The first workshop will bring together the three SPIRE projects (INSPIREWATER, SPOTVIEW and ReWaCEM) from the call "Water Management Systems – SPIRE01-2016" in order to share first results, compare the different sectoral needs, market uptake and talk about obstacles and synergies. The main aims of the projects are:

The ReWaCEM project aims at reducing water use, wastewater production, energy use and water footprint by between 30-90% as well as increasing valuable metal resource recovery in the metal plating, galvanizing and printed circuit board industry.

The objective of the SPOTVIEW project is to develop and demonstrate innovative, sustainable and efficient processes and technology components, in order to optimize the use of natural resources, especially water, in three industrial sectors (Dairy, Pulp and Paper and Steel) contributing to 44% of industrial water usage in EU.

INSPIREWATER aims to increase water and raw material efficiency in the process industry. We will use new and established resource-efficient technologies, to reduce water consumption, energy, use of chemicals and to reduce waste. This will be underpinned by a holistic water management framework which will complement existing management structures in process industry companies. The project will focus initially on the steel and chemical industries, with the long-term goal of applying the technologies across further process industry sectors for maximum impact.

As each project has a different focus on different process industries the cross-sectoral exchange will contribute to solutions for the process industry as a whole. Furthermore, experiences from cases and technologies will be used regarding the water management framework conceivably leading to synergies to boost the outcomes of each project.

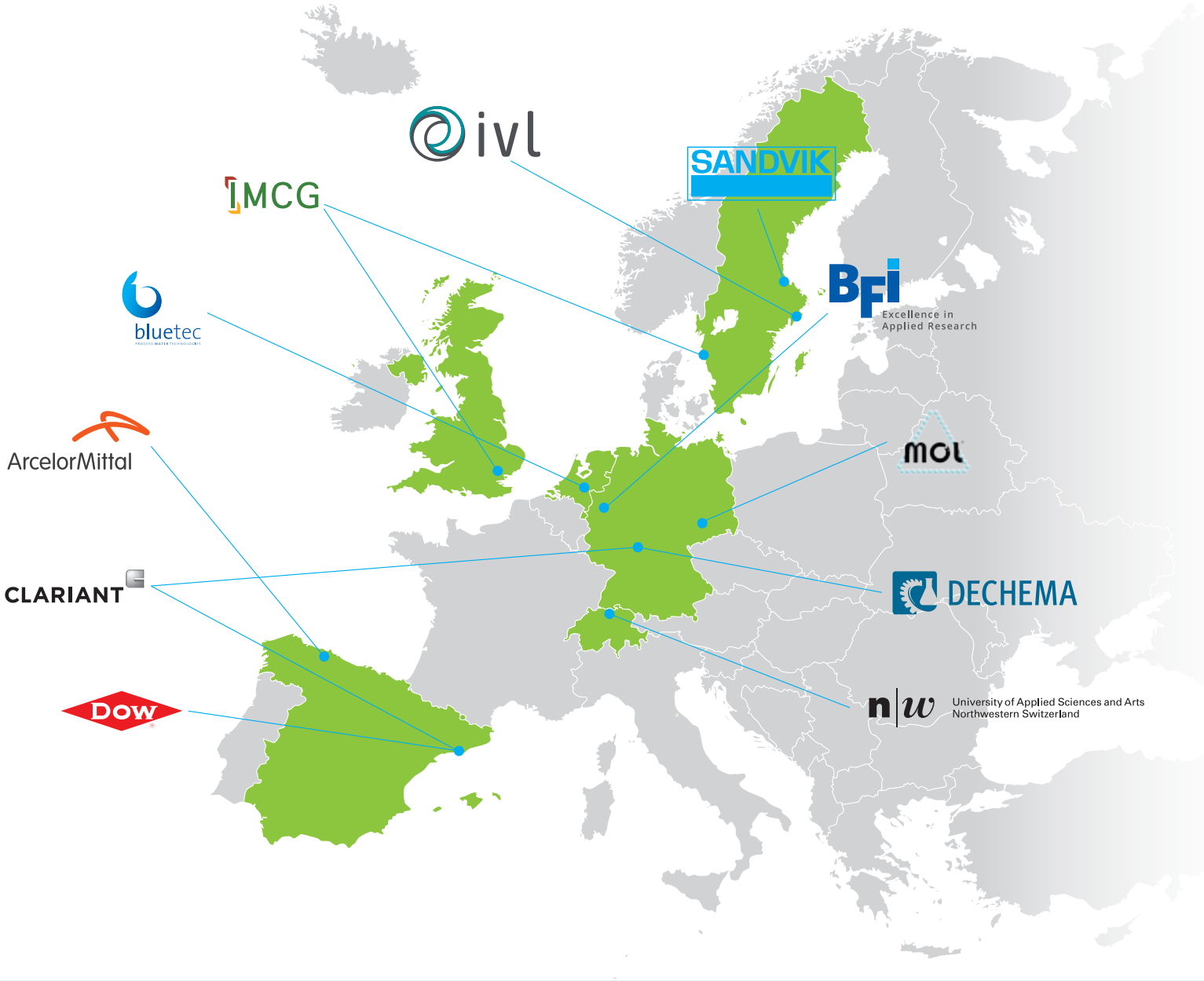
Learn more about *"Forward osmosis for water recovery from industrial wastewater with the aim of Zero Liquid Discharge"* and *"Surface-modified membranes for phosphorus recovery from sewage sludge ash"* presented by FHNW at the **"Aachener Wassertage" in Aachen, Germany, 24 – 25 October 2017.**

Meet us at the **"Industrietage Wassertechnik" in November 14 – 15, 2017 in Dortmund, Germany.**

Get more information about INSPIREWATER at **IFAT on May 14-18, 2018 in Munich, Germany.**

INSPIREWATER will also be present at the **ACHEMA 2018, 11 – 15 June, the world forum for chemical engineering and the process industry in Frankfurt, Germany.**

The **Industrial Water 2017** will take place in **November 2017**. Details will follow.



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