Energy-SmartOps
Integrated Control and Operation of Process, Rotating Machinery and Electrical Equipment

energy smartOps People: Early-stage researchers and supervisors

Esperanza Barrera (ESR-F)
From: Aviles — Visit: BASF
Host: Imperial — ESR-E, ESR-B

Esperanza received her M.Sc. Eng. degree in Energy Engineering from University of Oviedo (Spain) in 2011. Previously, she graduated as Chemical Engineer from University of Oviedo (Spain). Currently she is a PhD student at Imperial College London, under the supervision of Prof. Ricardo Martinez-Botas. Her research contributes to the field of deterioration modelling of centrifugal compressors.

Skills: Numerical simulation / Data analytics
Interests: Monitoring/modelling of turbomachinery

Robin Cartoux (ESR-N)
From: Paris — Visit: Thyssen
Host: ABB-DE — ESR-K, ESR-I

Robin received his M.Sc. degree in Control Engineering from University of Supelec (France) and M.Sc. in Control and Signal Processing from Paris South University (France). Currently, Robin is part of the Process & Production Optimization group in the ABB Corporate Research Centre Germany. His research topic is the production scheduling optimization of a steel plant.

Skills: Control system design / Signal processing
Interests: Process industries / Production scheduling

Bart Van Parys (ESR-M)
From: Leuven
Host: ETH

Bart holds a bachelor degree in electrical engineering and a master degree in applied mathematics, both from the University of Leuven, Belgium. He has been a research intern at the Interdisciplinary Centre for Scientific Computing in Heidelberg, Germany. Currently, Bart is a PhD student at the Automatic Control Laboratory in Zurich, Switzerland.
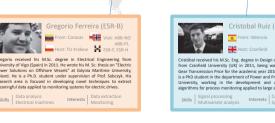
Skills: Convex optimization / Robust control
Interests: Risk analysis / Convex analysis

Hubert Hadera (ESR-K)
From: Rzeszow — Visit: Thyssen CMU
Host: ABB-DE — ESR-L, ESR-N

Hubert received his M.Sc. Eng. (2009) in Production Engineering & Management from Rzeszow University of Technology (Poland), and another M. Sc. (2011) in Energy Systems and Policies from University of Iceland. He collaborates with both academia (Carnegie Mellon University USA) and industry (ThyssenKrupp-AST Italy), and is currently a PhD student at Technical University of Dortmund.

Skills: Math programming / Optimization
Interests: Production scheduling / Process optimization

Sara Budinis (ESR-J)
From: Genova — Visit: Xodus CCC
Host: Imperial — ESR-F, ESR-G

Sara received her B. Eng. degree (2006) and M. Eng. degree (2009) in Chemical Engineering and her M. Sc. (2012) in Industrial Engineering from University of Genoa (Italy). Sara worked as R&D Aerodynamic engineer in Ansaldo Energia since June 2009 until September 2011. She is a PhD student at Imperial College London under supervision of Professor Nina F. Thornhill.

Skills: Math modelling / Control systems
Interests: Process Engineering / Simulation

Alejandro Fernandez (ESR-A)
From: Vigo — Visit: ETH ABB-PL
Host: TU Krakow — ESR-C, ESR-O

Alejandro received his M.Sc. degree in Electrical Engineering from University of Vigo (Spain) in 2010, with a thesis on "Modelling and analysis of a 3D squirrel cage motor". He is a PhD student under supervision of Prof. Tadeusz Sobczyk working on electromechanical energy conversion and fault diagnosis of electrical machines.

Skills: Math. modelling / MCSA techniques
Interests: Electrical motors / Fault diagnosis

Matteo Cicciotti (ESR-E)
From: Cerignola — Visit: Imperial
Host: BASF — ESR-G, ESR-F

Matteo Cicciotti graduated in Chemical Engineering from Politecnico di Milano (2011), joined at BASF as automation engineer ESR for Energy-SmartOps, and, under the supervision of Prof. Ricardo Martinez-Botas, he enrolled as PhD candidate at Imperial College London. His research contributes to the field of model-based monitoring and optimal operation of industrial networks of compressors.

Skills: Numerical methods / Data driven models
Interests: Monitoring / Optimization

Ricardo Gozalbo (ESR-F)
From: Valencia
Host: Imperial

Ricardo holds a MSc in Internal Combustion Engines from Universidad Politecnica de Valencia (Spain) and and MEng in Aerospace Engineering from University of Bath (UK). He participated in ESR-F from March 2011 to September 2012 working on Assessment modelling of fouling on industrial centrifugal compressors. His project task was taken over by Esperanza Barrera in early 2013.

Skills: Aerodynamics / Turbomachinery
Interests: Blogging / Aircraft desing

Dragoljub II Gajic (ESR-L)
From: Valjevo — Visit: ABB-DE CMU
Host: Thyssen — ESR-K, ESR-N

Dragoljub received his M.Sc. in Electrical Engineering (2007) and M. Sc. in Mechanical Engineering (2011), both from University of Belgrade (Serbia). Currently Dragoljub is dealing with energy savings and production integration at Acciai Speciali Terni S.p.A. in Italy. Additionally, he is a PhD candidate at School of Electrical Engineering (ETF), University of Belgrade and University of L'Aquila.

Skills: Signal processing / Data mining
Interests: Energy efficiency / Process automation

David Romero (ESR-H)
From: Morelia — Visit: Imperial Statoil
Host: ABB-NO — ESR-B, ESR-F

David holds a M.Sc. Degree in Mechatronics and Micromechatronic Systems from Hochschule Karlsruhe (Germany) with a thesis on automation and HMI design of a triaxial machine for biomechanical testing. Currently, he works in ABB Oil and Gas, designing interfaces for visualization of connectivity. He is also a part-time PhD student in Imperial College London under the supervision of Prof. Nina Thornhill.

Skills: C#, WPF, Graph# / CAE, Human factors
Interests: Topology engineering / User centered design

Dionysios Xenos (ESR-G)
From: Athens — Visit: BASF
Host: Imperial — ESR-E, ESR-F

Dionysios graduated as Mechanical Engineer from University of Athens (Greece) in 2011. He joined the Energy SmartOps project in October 2011 and since then he is a PhD student under the supervision of Professor Nina Thornhill. His research focus is on the optimal operation and maintenance of industrial gas compressor stations using optimization methods such as Mixed Integer and Linear Programming.

Skills: Math. programming / Modelling
Interests: Integrated systems / Optimization

Victor Jaramillo (ESR-C)
From: Bogota — Visit: ETH
HoSt: ABB-PL — ESR-A, ESR-D

Victor received his M. Sc. in Mechatronics from University of Castilla-La Mancha (Spain) in 2009. After his Master studies he continued with the Ph.D., in the same University, working on vibration control of flexible manipulators. His research focuses on Condition Monitoring of Rotating Machinery, and applications of Machine Learning and Big Data for Health Condition Assessment.

Skills: Condition monitoring / Data fusion
Interests: Big data, robotics / Machine learning

Gregorio Ferreira (ESR-B)
From: Caracas — Visit: ABB-NO ABB-PL
Host: TU Krakow — ESR-F, ESR-H

Gregorio received his M.Sc. degree in Electrical Engineering from University of Vigo (Spain) in 2011. He wrote his M. Sc. thesis on "Electric Power Solutions on Offshore Vessels" at Gdynia Maritime University, Poland. He is a Ph.D. student under supervision of Prof. Sobczyk. His research area is focused in developing novel techniques to extract meaningful data applied to monitoring systems for electric drives.

Skills: Data analysis / Electrical machines
Interests: Data extraction / Monitoring

Cristobal Ruiz (ESR-D)
From: Valencia — Visit: ABB-PL
Host: Cranfield — ESR-C, ESR-A

Cristóbal received his M.Sc. Eng. degree in Design of Rotating Machines from Cranfield University (UK) in 2011, being was awarded with the Gear Transmission Price for the academic year 2010/2011. Currently he is a PhD student in the department of Power and Propulsion at Cranfield University, working in the development and assessment of new algorithms for process monitoring applied to large scale industrial sites.

Skills: Signal processing / Multivariate analysis
Interests: Condition monitoring / System identification

Matteo Biondi (ESR-I)
From: Genova — Visit: Statoil Thyssen
Host: ABB-DE — ESR-K, ESR-N

Matteo received his M.Sc. degree in Mathematical Engineering at Politecnico di Milano (Italy). His thesis contributed to the development of a production scheduling in the metal industry. He joined ABB Italy as responsible for the engineering and commissioning of a multivariable, model predictive control. Now, he is in ABB Germany working on a joint maintenance and production scheduling problem for process plants.

Skills: Linear programming / Process optimization
Interests: Production scheduling / Process optimization

Giampaolo Torrisi (ESR-O)
From: Florence — Visit: ABB-PL
Host: ETH — ESR-A, ESR-C

Giampaolo received his M.Sc. degree in Electrical and Automation Engineering in 2012 from University of Florence, Italy. He developed his Master Thesis at ETH Zurich, Switzerland, in building temperature control. After a work experience in Eli Lilly, Italy, in March, 2013 he joined the "Automatic Control Laboratory" of ETH Zurich as a Ph.D. candidate, under the supervision of Prof. Roy Smith and Dr. Mariéthoz.

Skills: Control / Optimization
Interests: Turbomachinery / Electric converters

Prof. Nina F. Thornhill
Imperial College London
Process Automation, Operations and Control

Prof. Ricardo Martinez-Botas
Imperial College London
Turbomachinery

Dr. Yi Cao
Cranfield University
Fault detection and diagnosis

Prof. David Mba
Cranfield University
Fault detection and diagnosis

Prof. Dr hab. Tadeusz Sobczyk
Politechnika Krakowska
Electrical Motors

Dr. James Ottewill
ABB CRC - Poland
Control of compressors

Dr. Iiro Harjunkoski
ABB CRC - Germany
Optimization and Scheduling

Dr. Guido Sand
ABB CRC - Germany
Process Performance Optimization

Mrs. Tone-Grete Graven
ABB Oil and Gas - Norway
Data visualization, Interaction design and human factors

Dr. Luca Onofri
ThyssenKrupp
Scheduling, hot-rolling processes

Dr. Sebastien Mariéthoz
ETH Zurich
Systems and Control

Dr. Arne Ulrik Bindingsbø
Statoil
Project Manager at StatoilHydro

Bob Hodder
ESD, MAIChE
Process Engineer, Operations Supervisor and Training Manager

Prof. Ignacio Grossmann
Carnegie Mellon University
Chemical Engineering Faculty

Overall aim
The overall scientific and technical aim of the ENERGY-SMARTOPS project is to take a pivotal role in demonstrations of creative ideas for energy savings in large scale industrial sites making the best possible use of measurements from all plant subsystems: process, utilities, mechanical equipment and electrical equipment. The project integrates in-depth understanding of the operational issues with analysis of measurements and first-principles physical knowledge to invent and develop tools that will be deployed in the field in case studies with the transmission operator partners. Three specific research objectives are:
- To develop scalable and complete equipment monitoring systems
- To devise new algorithms for overall performance monitoring and control
- To study ways that energy savings can be achieved

Project goals and scope
Execution of the ENERGY-SMARTOPS project involves activities in five work package each of which will address one or two of three Research Objectives, as follows:
- Research Objective 1: To develop scalable and complete equipment monitoring systems
- Research Objective 2: To devise new algorithms for overall performance monitoring and control
- Research Objective 3: To study ways that energy savings can be achieved

The project is organized in 5 Work Package (WP), which are shown in the figure to the right. Each one has been organized in a way that it includes at least one industrial partner and one or more universities.

WP1: Electromachinery
WP2: Turbomachinery
WP3: Maintenance & diagnostics
WP4: Energy optimization
WP5: Electricity optimization
Project supervisors

Institutions involved
- Imperial College London
- ABB (Germany, Poland, Norway)
- Cracow University of Technology
- ETH Zurich
- BASF
- Cranfield University
- ThyssenKrupp Italy

Associated partners
- Carnegie Mellon University
- Statoil
- ESD Simulation Training