Innovative Sector Exchange Project



European Regional Development Fund

ISEPROJECT.EU

INNOVATING FOR INTERNATIONAL MARKETS

Mechatronics

Mechatronics is a rapidly-evolving field encompassing mechanical and electrical engineering and ICT. A growing European industry in its own right, mechatronics is a crucial source of innovation for sectors ranging from food and drink and product design to healthcare and osmotic power generation ('blue energy'). The ISE region is home to many dynamic SMEs, including some genuine world leaders, that are active in mechatronic research, development and manufacturing. The ISE project has helped bring these companies together to share knowledge as part of an open innovation culture. A THEY ARE AN VERY

Technology in Motion

As its name suggests, mechatronics was originally a simple combination of mechanics and electronics. Although the term has been in use for more than 40 years, it's still widely misunderstood, with many people regarding it as synonymous with robotics or electromechanical engineering.

In fact, mechatronics is a rapidly-evolving, multidisciplinary field incorporating mechanical engineering, electronics, computer engineering, telecommunications engineering, systems engineering and control engineering. The French NF E 01-010 standard defines it as: 'an approach aiming at the synergistic integration of mechanics, electronics, control theory, and computer science within product design and manufacturing, in order to improve and/or optimize its functionality'.

In practical terms, mechatronics seeks to unify the many different subfields of engineering emerging and multiplying as technology advances. As the technical systems involved become more complex, the definition of mechatronics continues to broaden, constantly opening up new spaces for innovation.

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Internet of Things (IoT)

The internet of things (IoT) is a relatively recent term. It refers to a network of physical objects that use electronics, software, sensors, actuators and network connectivity to collect and exchange data. Encompassing consumer, commercial, industrial, and infrastructure applications, the IoT covers everything from connected vehicles, home automation and wearable technology to healthcare equipment and even domestic appliances.

IoT and mechatronics are complementary, since many smart components associated with the Internet of Things are essentially mechatronic in nature. The growth and development of the IoT is increasingly driving research into how mechatronic systems and components are perceived, designed and manufactured. As well as the practical and technical challenges, there are important issues around data security, machine ethics and the human-machine interface to be addressed.

ISE PROJECT MECHATRONICS

Industry 4.0

The IoT is a fundamental component of Industry 4.0 – also called the Fourth Industrial Revolution – which refers to the trend towards increased automation and data exchange in manufacturing technologies. Industry 4.0 is fostering a new generation of 'smart factories', where cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. These systems use the IoT to communicate with each other and with humans all along the value chain.

Industry 4.0 will rely on machines that are smart and capable of learning, capturing data and interacting with other machines, and their own operators, to achieve higher levels of flexibility and performance. The challenge for the mechatronics sector is to translate these concepts into practical, user-friendly applications.

Collaboration between knowledge centres, innovation platforms and test facilities is crucial to create new systems and networks that connect the physical and virtual worlds. Within the ISE project, these challenges present significant innovation and internationalisation opportunities for SMEs.



Sirris and FMTC's Eco-mechatronics roadmap initiative has helped companies achieve

20-30% energy savings

10% reduction in resource consumption



Eco-Mechatronics

The ISE region is already becoming established as a leader in eco-mechatronics, an important subfield focusing on creating machines delivering a lower ecological impact and total cost of ownership, without compromising performance. This involves innovation across a wide range of parameters, including energy efficiency, recovery and storage, productivity, precision and materials savings, as well as reduced noise and vibration for improved user comfort.

Machine manufacturers are not always aware of the potential improvements in energy efficiency, performance and user comfort they could make to their products. Since 2011, Belgium's technology organisation Sirris and research lab FMTC have run the Eco-mechatronics roadmap initiative to help companies translate mechatronics research into practical applications and integrate innovative technology into their products. The results include energy savings of 20-30%, resource consumption reduced by 10%, and noise and vibrations cut by around 8dB.

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CASE STUDY

Factory of The Future, West Flanders

The West Flanders Machine & Mechatronics (M&M) cluster is an essential innovation partner in four key sectors where West Flemish companies rank among the best in the world.

West Flanders Machine & Mechatronics cluster



In 2019 total investment of 4 million euros

Five new laboratories opened – explicitly focused on the needs of production companies

Increased the number of mechatronics researchers by 50%

Fabrieken voor de Toekomst Machinebouw & Mechatronica

Launched in 2015, the Fabrieken voor de Toekomst Machinebouw & Mechatronica (Factory for the Future Machine Building & Mechatronics) is a partnership between the Provincial Development Agency (POM) and Technical University Alliance (TUA) West to provide SMEs with open test and innovation platforms and help them find innovation partners at home and overseas. Its ultimate vision is to expand the region's mechatronics sector to sustain 30,000 direct jobs. The scheme is supported by the Competence Center Machinebouw & Mechatronica, which brings together the expertise of important knowledge centres across Flanders. KU Leuven, for example, has two innovation labs on its new campus in Bruges conducting research on cyberphysical systems and Industry 4.0; in Kortrijk, UGent and Sirris labs focus on flexible assembly and smart production organisation. The Howest technology lab has unique strengths in augmented & virtual reality, while the VIVES Maaklab focuses on innovation in manufacturing including 3D metal printing and digital measurement technology.



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Initiatives like the Factory for the Future Machine Building & Mechatronics in West Flanders are important sources of information, advice and support. Other countries within the ISE region have their own schemes to promote Industry 4.0, such as the Dutch Smart Industry Agenda, which is creating five regional Digital Innovation Hubs in the Netherlands, and l'Alliance industrie du future (AIF) in France.

Summary

Research and industrial activities in the ISE region clearly demonstrate that the factories of the future will be based around smart technology and the IoT. As a result, mechatronics will become an increasingly mainstream field, expanding from its current base in highly technical sectors like healthcare and blue energy into more conventional manufacturing. For SMEs developing mechatronic systems, there are many opportunities for collaborative work with academic institutions, government agencies, regional business organisations and other like-minded companies. It's important that, as well as developing their new technologies, companies communicate the benefits clearly and positively to potential users to promote uptake, helping to create a positive feedback loop that encourages further innovation.

For manufacturers, Industry 4.0 is already here, and the direction of travel is clear. Mechatronics and smart manufacturing have great potential to improve processes, boost efficiency and reduce costs through data sharing, connectivity and machine learning. To remain competitive in the long-term, manufacturers need to embrace this new technology; however, it's complex and evolves rapidly, which may discourage some companies. Initiatives like the Factory for the Future Machine Building & Mechatronics in West Flanders are important sources of information, advice and support. Other countries within the ISE region have their own schemes to promote Industry 4.0, such as the Dutch Smart Industry Agenda, which is creating five regional Digital Innovation Hubs in the Netherlands. and l'Alliance industrie du future (AIF) in France.













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