The Digital Circular Economy

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IRIS business lines

**IRIS MONITORING**

**CYBER-PHYSICAL SYSTEMS**

Turnkey spectroscopy-based solutions for process monitoring and quality control.

**IRIS SMAC**

**SMAC: ‘Social, Mobile, Analytics & Cloud’**

New levels of business productivity and client engagement.

**IRIS INNOVATION**

>20 ongoing EU-Funded projects on:

**Resource efficiency via Industry 4.0** applied to:

- Process Industries (SPIRE),
- BioBased Industries (BBI),
- Advanced materials and high value manufacturing (NMBP),
- and more
Circular Economy

**The Circular Economy Goal:** Decouple as much as possible industry and nature (minimise waste and extraction of non-renewable resources)

- **Commercial Opportunity:** $4.5 Trillion by 2030 (Accenture)
- **Business Threat:** 40% of S&P500 may go out of business in 10 years (SAP)
- **Competitive Advantage:** Early adopters outperform competition (SAP)

**Circular Economy Core Strategies:**

1. Close supply chains *(recycle, reuse, remanufacture, recover)*
2. Sell/exchange your waste *(byproduct synergies)*
3. Share resources *(co-working, facilities, etc.)*
4. Increase resource and energy efficiency *(process optimization)*
5. Extend product/asset useful life *(inspection & maintenance)*
Among many valid views to describe the **Industry 4.0 paradigm**, the IRIS’ one:

- Effectively collecting a huge amount of **reliable and informative data** - not only about the process conditions but also about what is really taking place within the process.

- **Unveiling** relevant information from the data by supporting the involved ICT tools with **science-based** resources in order to build **learning and objective** decision support systems while continuously improving data collection.

**Key digital trends shaping Industry 4.0:**

- **Internet of Things (IoT):**
  - ✔️ 30–50 billion devices online, creating a market of $267Bn by 2020 (Forbes)

- **Big Data Analytics:**
  - ✔️ Global revenues for big data analytics will exceed $203 billion in 2020 (IDC)

- **3D-printing and digital twin:**
  - ✔️ 3D printing: the making of a physical object from a three-dimensional digital model
  - ✔️ **Digital twin**: a three-dimensional digital model of a physical object, **updated in real-time**

- **Mobile devices/connectivity:**
  - ✔️ 60-90% of time spent online is through mobile devices (comScore)
• Maintenance maturity levels
  • Level 1 *Visual inspections*: periodic physical inspections; conclusions are based solely on inspector’s expertise.
  • Level 2 *Instrument inspections*: periodic inspections; conclusions are based on a combination of inspector’s expertise and instrument read-outs.
  • Level 3 *Real-time condition monitoring*: continuous real-time monitoring of assets, with alerts given based on pre-established rules or critical levels.
  • Level 4 *Predictive Maintenance 4.0*: continuous real-time monitoring of assets, with alerts sent based on predictive techniques, such as regression analysis.
Circular Economy 4.0

Five ways in which the digital transformation disrupts production systems towards a circular economy:

1. Tracking and tracing
2. Intelligent asset management
3. Advanced process control and monitoring (PAT)
4. Digital Decision-Support and Management Systems
5. Digitalisation of manufacturing
Case 1 – Closing the supply chain

Goal:
Reuse, Recover, Recycle, Remanufacture

Key challenge:
Tracing and tracking materials and components across their life-cycle (location, quantity, quality, state/condition)

Digital solutions:

- RFIDs (e.g. electronics)
- DNA-tagging (e.g. textiles)

Case 2 – Industrial Symbiosis

Goal:
Establish by-product synergies and/or share resources with industries in close proximity

Key challenge:
Lack of info on needs and byproducts, high transaction costs, confidentiality and trust issues

Digital Solution: SHAREBOX
A digital platform for secure (anonymous) info sharing, opportunity identification, and synergy management through intelligent decision support systems
Case 3 – Process optimisation

**Goal:**
Improve resource and energy efficiency within production lines.

**Key challenge:**
Continuous monitoring and control of multiple inter-related dynamic processes, information overload

**Digital Solution: End-to-End Process Control**
PAT technologies obtain relevant data in real time, perform online chemical analysis, and apply deep-learning algorithms to provide recommendations to the operator.
Case 4 – Extend lifespan

Goal:
Prolong product functional life, delay decommissioning/scrapping

Key challenge:
Increasingly costly and frequent repair and maintenance

Solution: Digital Asset Management (Digital Twin)
Use available data to create a virtual replica of the product and use predictive modeling to anticipate and repair damage

Example: Aircraft engine
5,000 sensors, 10GB per second, GE’s Predix, product-service model.
Relevant SPIRE Projects

- **PROPAT** - Robust and affordable process control technologies for improving standards and optimising industrial operations ([www.pro-pat.eu](http://www.pro-pat.eu))
- **SUPREME** - Sustainable and flexible powder metallurgy processes optimization by a holistic reduction of raw material resources and energy consumption (to be launched September 20th)
- **IBD** - Intensified by Design® for the intensification of processes involving solids handling ([www.ibd-project.eu](http://www.ibd-project.eu))
- **ECOBULK** - Circular Process for Eco-Designed Bulky Products and Internal Car Parts
Thank YOU