Együttműködés a bizalom alapján: A SZTAKI és a Fraunhofer Társaság két évtizedes kooperációja

Dr. Monostori László
Igazgató, SZTAKI

Magyar-német online üzleti workshop
2023. december 5. (on-line)

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SZTAKI – In a nutshell

CENTRE OF EXCELLENCE EPIC
Production Informatics and Control
Cooperating for Innovation and Excellence

- **Some facts from our history**
  - Established in 1964, as Research Institute of the Hungarian Academy of Sciences (MTA)
  - EU CoE in IT, Computer Science and Control, 2001
  - Virtual Inst. on Production and Business Management (PBM), 2002
  - Fraunhofer Project C. for Production Management and Informatics, Fraunhofer (PMI), 2010
  - EU CoE in Production Informatics and Control (EPIC), 2017
  - Common legal entitiy: EPIC InnoLabs Ltd, 2018
  - 45 FP7 projects, 22 H2020 projects, ERC advanced grant
  - Eötvös Loránd Reseach Network (ELKH), 2019
  - Autonomous Systems National Laboratory, 2020
  - Artificial Intelligence National Laboratory, 2020
  - HUN-REN Hungarian Research Network, 2023
- **Basic research**
  - Computer science
  - Systems- and control theory
  - Engineering and business intelligence
  - Machine perception and human-computer interaction
- **Applied research and innovation**
  - Vehicles and transportation systems
  - Production informatics and logistics
  - Energy and sustainable development
  - Security and surveillance
  - Networked systems and services, cloud and high-performance computing
- **Staff**
  - ~ 380 (FTE)
  - ~ 100 with scientific degree
  - 6 members of the Hungarian Academy of Sciences
  - 14 with DSc degree
  - 73 with PhD degree
  - ~ 15 members of the Hungarian Academy of Engineering

IFAC IEEE IRP AWK acatech DEUTSCHE AKADEMIE DER TECHNIKWISSENSCHAFTEN

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Main industrial partners

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- Computer Science: Ericsson Hungary, OTP Bank, Bosch
- Engineering and Management Intelligence: Hitachi, Audi Motor Hungaria, GE Hungary, Jaguar LandRover, Opel, Volvo, Festo, BPW, Knorr-Bremse Fékrendszerek Kft, Aventics Hungary, Denso + significant number of SMEs
- Systems- and Control: Audi, Knorr-Bremse Fékrendszerek Kft, Paks Nuclear Power Plant
- 2015: MTA SZTAKI's subsidiary in Győr (within EPIC)
- 2016: MTA SZTAKI' subsidiary in Kecskemét
- ~30 patent applications in the past 10 years, ~20 with Hitachi

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Cyber-physical lab. at the EPIC-subsidiary in Győr

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MTA – Audi – SZTAKI – Győr – Széchenyi István University cooperation

- Centre of Excellence in Vehicle Technology Research (J3K)

Industrial Digitalisation Days INDIGO with FhG

https://indigonap.hu/

Common presence at international fairs

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Research projects – EU H2020 Programme

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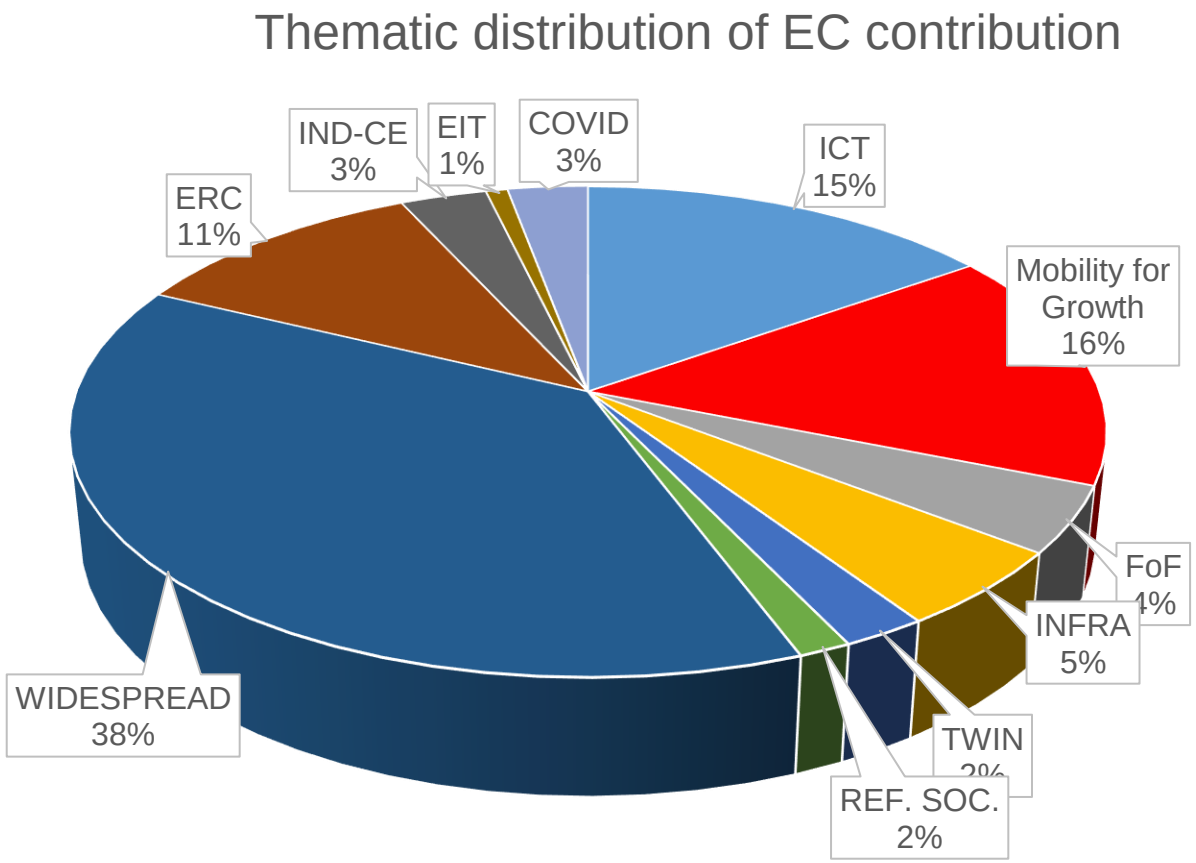
- SZTAKI participates in 20 H2020 projects and in 2 EIT
- Roles: Participant in 16 projects, Coordinator in 6 project
- Total EC contribution: ~23 M€
- In 11 H2020 projects SZTAKI works together with 11 Fraunhofer institutes (IPA, IPK, IPT, IML, IGD, IZI, FIT, SCAI, FKIE, HHI, ISS and Fraunhofer Austria.
- SZTAKI coordinates 5 from them.
- Total support from the EU and the FFG is



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EPIC: European Centre of Excellence (2017-2024)

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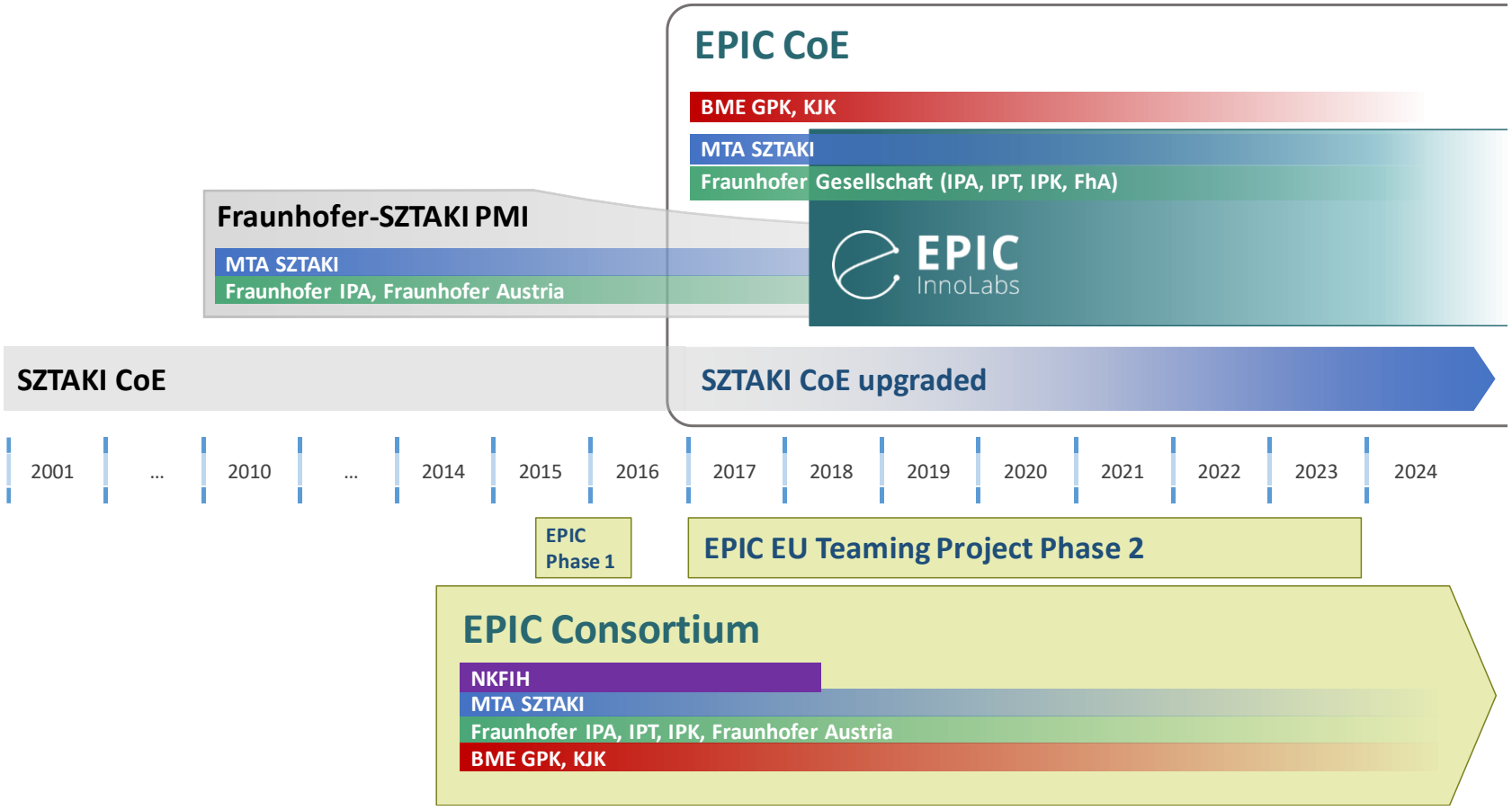

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EPIC InnoLabs in numbers

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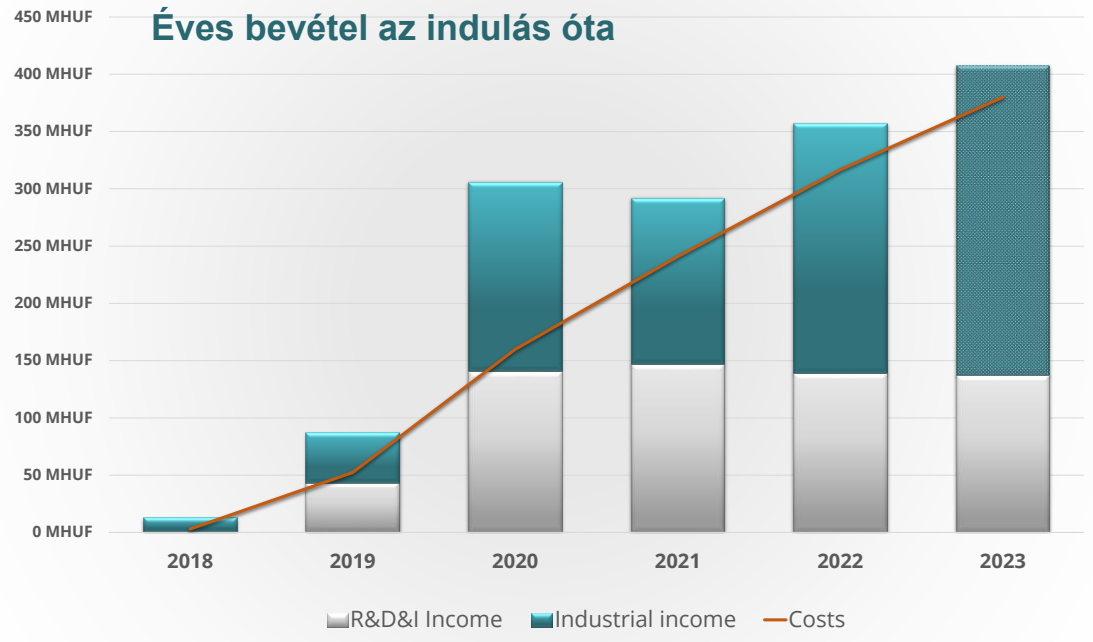
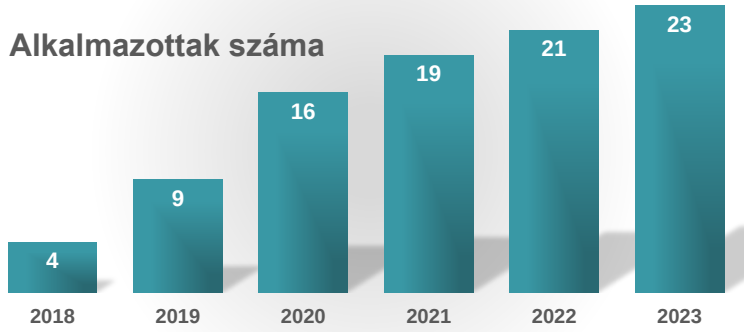
Alapítás **június 2018**	**Projektek száma** **+100**
Partnerek száma **+50**	**Tapasztalat években** **+100**





Management System ISO 9001:2015
TÜVRheinland CERTIFIED
www.tuv.com ID 9000009726

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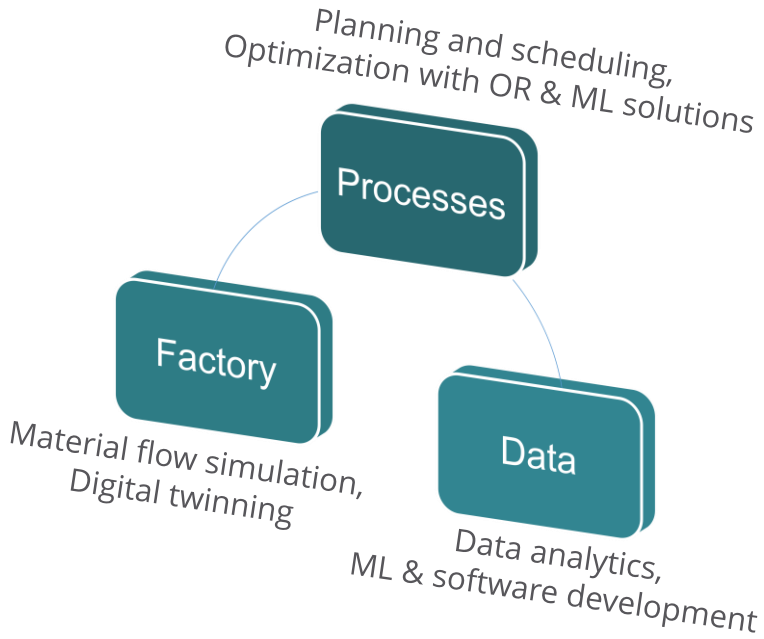
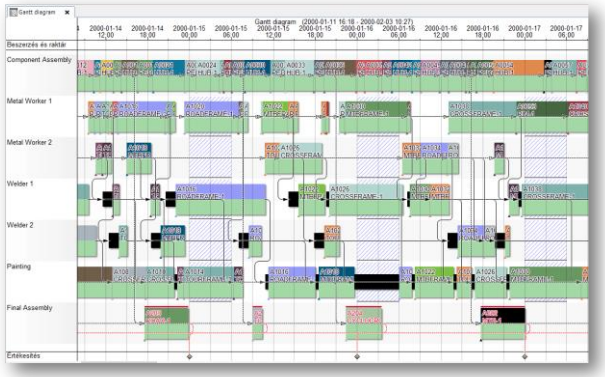
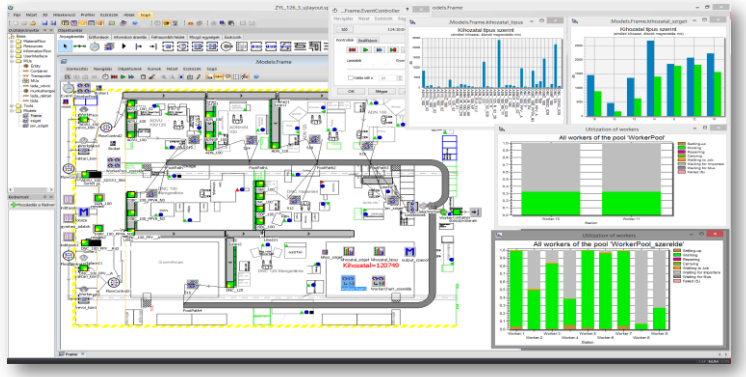
Typical applications



- System's analysis and optimization by simulation
- Logistics and supply chain optimization
- Provision of I4.0 trainings and consultancy
- Implementation of planning and scheduling systems
- Prediction of performance KPIs with ML & AI algorithms
- Development of data analytics and BI systems
- Development of OR, AI/ML industrial solutions





Digital twinning

Challenges

Originally fully automated factory turning into human logistics support

Increasing product types, but constant output

High traffic and ARV blocking ending in underutilized machines

Solution

Experiments with different task distribution logics

Analyzing task lead times, monitoring ARV and machine utilizations

Detailed execution and control with digital twinning

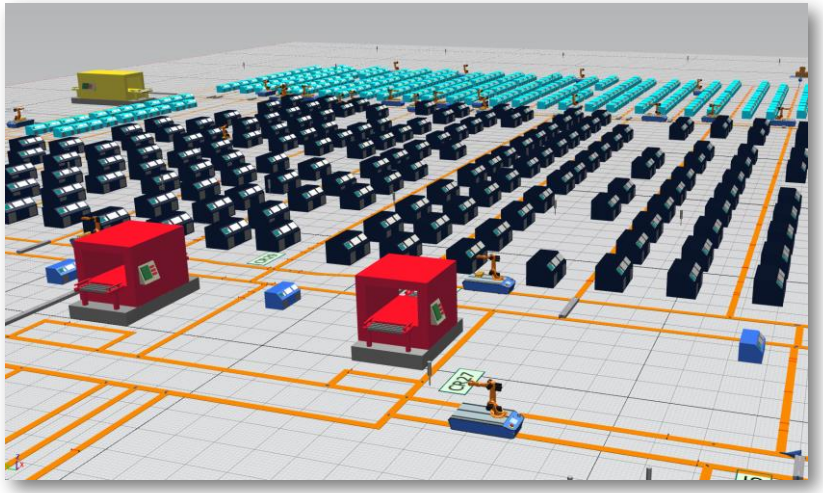
Results

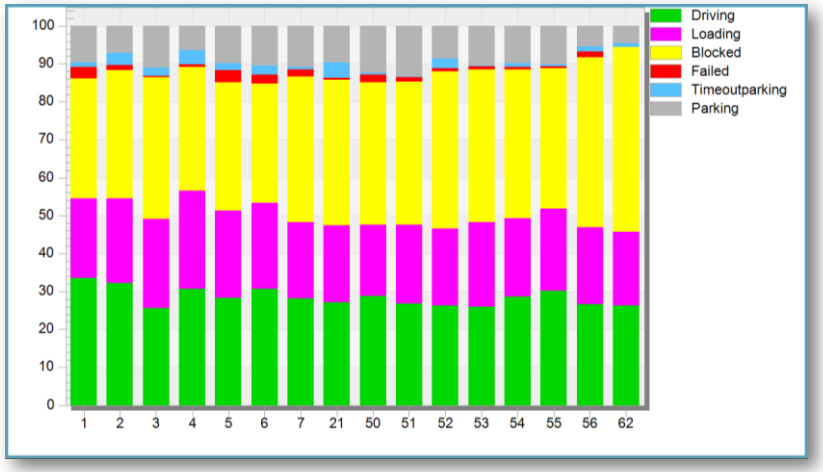
Auto rate: +9% improvement – now 99%

Finished tasks: 20% improvement

Lead and task duration time: ~ 30% reduction

ARV fleet: 2 ARVs can be allocated to other areas





Scheduling

Challenges

Two plants for manufacturing and assembly with different scheduling rules

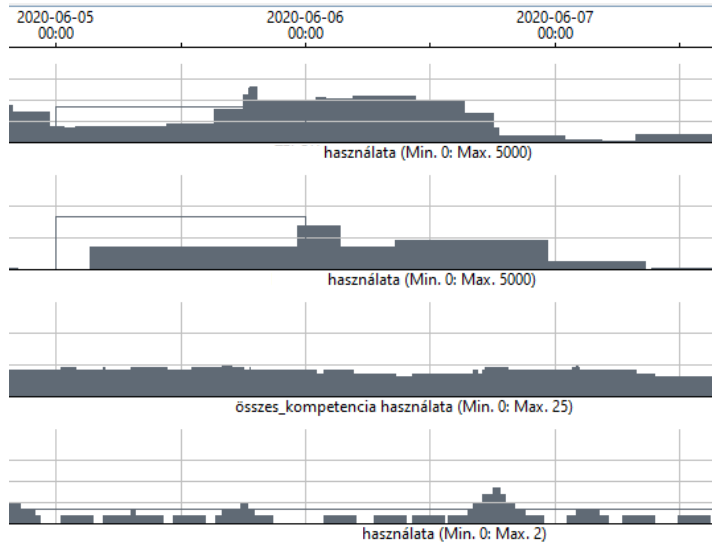
Manufacturing plant: long lead times with 1-2 operations

Assembly: short lead times with 5+ operations

Solution

New scheduler has been developed to handle various routings for parts

Two different models have been implemented for the plants

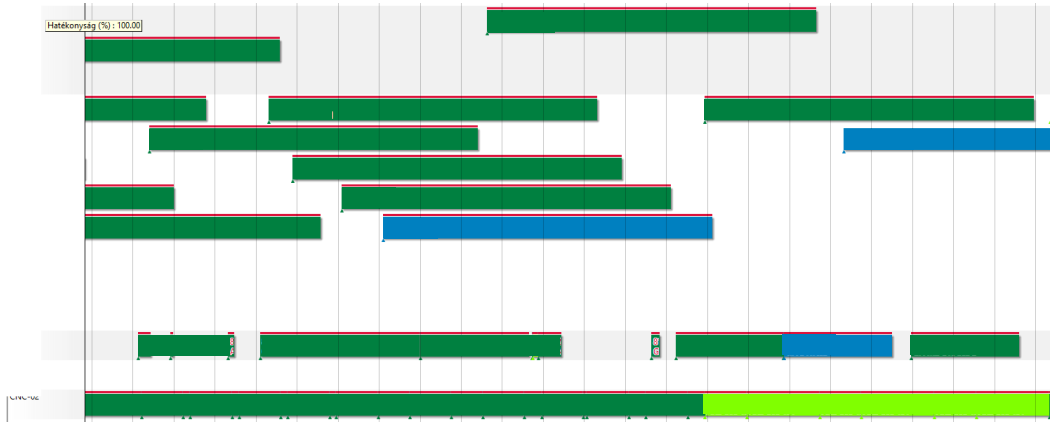


Results

Fully functional APS implemented integrating two scheduling models

Seamlessly connected to the ERP system, synchronized scheduling

Improved on-time delivery performance and commitment



Data analytics

Challenges

Missing transparency level by widening explicable time window

Difficulty in detection of problematic steps, locating the bottleneck events

Non-existing knowledge of the cause of delays

Solution

Decrypted and validated model of machine's behaviour by data analytics

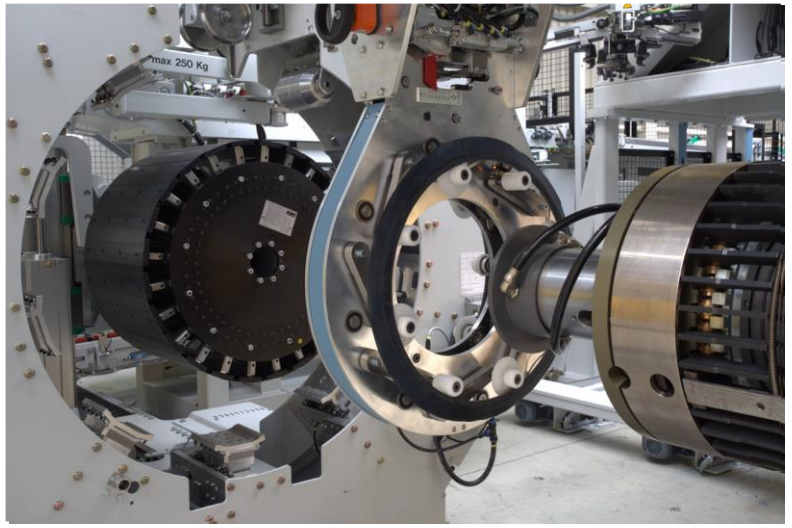
Online dashboard for the analytical results

Recommendation system for production planning and scheduling

Results

Reactive tool with filtering for a specific time window and product type in order to:

- Find the cause of delays
- Compare the performance of machines
- Analyse message network in details



Positive evaluations

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A long journey becomes easy when you find a right partner. And for us EPIC InnoLabs is one such reliable partner that is walking with us and supporting us in each step in this journey called Digitalization of Manufacturing.

Nitin Kaushik
Head - Digital Manufacturing
Apollo Tyres

It has been a pleasure working with EPIC InnoLabs. I really appreciate their depth of expertise on optimizing manufacturing, their insightful and creative thinking, their engagement and commitment to our partnership. They are willing to go that extra mile to find the right solutions for our process.

Jhun Vitualla
Project Manager
Western Digital

The joint simulation project with EPIC InnoLabs demonstrated their expertise and helped us to optimize and understand our manufacturing processes deeper.

István Drágán
Process Engineer Manager
Vincotech

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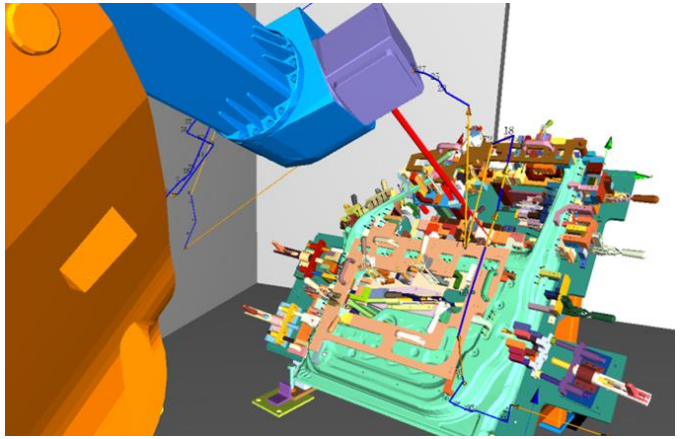
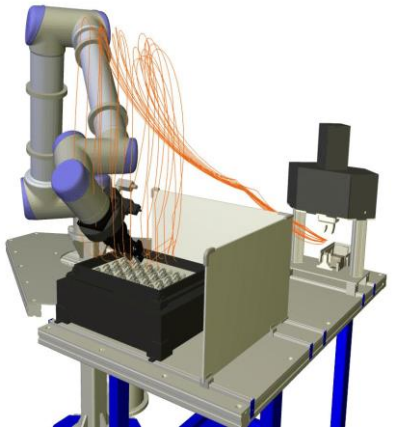
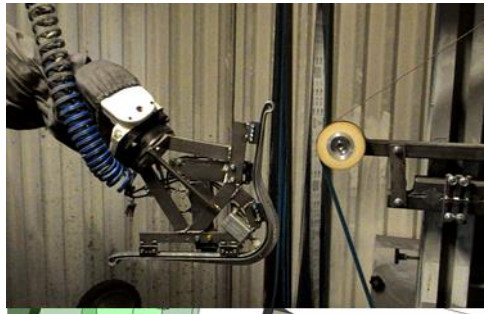
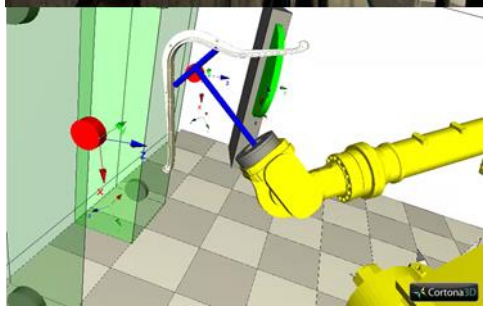
Advanced, smart robotics

- Objectives
  - Supporting autonomous robot behavior
  - In broad spectrum of manufacturing domains
    - Remote laser welding, grinding, machining … pick & place … human-robot collaborative assembly
- Solution approach – generic tools
  - Digital Twin using linkage model
  - Situation recognition, machine learning
  - Optimized task sequencing and path planning
    - Collision avoidance, human safety
  - Multi-channel human-robot communication
  - Automatic offline programming
- Combined into workcell design methodology
  - Digital „closeness” and tolerances observed
- Experimental cyber-physical laboratories
  - @ Győr, @ Budapest









Wissenschaftsfestival, Stuttgart, 2022.06.29.

Fraunhofer SZTAKI EPIC InnoLabs

2. STUTTGARTER WISSENSCHAFTSFESTIVAL stuπgart

EINLADUNG

zur Eröffnungsfeier der OpenLab Ausstellung des Stuttgarter Wissenschaftsfestivals

"ROBOTERSPIELPLATZ"

Einblicke in die Kombination von Robotik und Künstlicher Intelligenz

29.06.2022, 9 Uhr
Rathaus Stuttgart
Marktplatz 1 70173 Stuttgart
Festsaal im 1.Stock des Rathauses

Aus Anlaß des 20-jährigen Jubiläums der Kooperation zwischen dem Fraunhofer IPA und dem SZTAKI freuen sich die Wissenschaftlerinnen und Wissenschaftler, an die Ergebnisse ihrer inspirierenden gemeinsamen Arbeit zu erinnern und im Rahmen des Wissenschaftsfestivals das gemeinsame OpenLab-Projekt zu präsentieren.

Programm 9:00-9:30

Grußworte:
Dr. András Izsák
Generalkonsulat von Ungarn in Stuttgart

Prof. Dr. Thomas Bauernhansl
Leiter des Fraunhofer-Instituts für Produktionstechnik und Automatisierung

Prof. Dr. László Monostori
Direktor von SZTAKI (Forschungsinstitut für Computerwissenschaften und Automatisierung)

20 Jahre in 2 Minuten - Momente der Zusammenarbeit
Besichtigung der OpenLab Ausstellung
Sektanstoß

Die Teilnahme an der Eröffnungsfeier ist nur auf Einladung möglich.

Wissenschaftsfestival, Stuttgart, 2022.06.29.

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Thank you for your attention!

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