Smart manufacturing technology applied in companies' production processes

Project Output 2.2

Interreg

Co-funded by the European Union

Northern Periphery and Arctic

RoboDemo

Smart manufacturing technology applied in companies' production processes

Indicator: Smart manufacturing technology solutions are developed based on the actual needs of the collaboration companies in order to increase the productivity, efficiency, and competitiveness in each company.

The solution examples include rapid technological experiments and demonstrations with transferable devices on the premises of the SME's or in another industrial operating environment.

This output presents the outcomes of the RoboDemo project, which aims to facilitate technology transfer to SMEs through demonstrations, simulations, and piloting actions. The project engaged 26 SMEs across multiple sectors, addressing 30 challenges in automation, robotics, and process optimisation. Key achievements include tailored solutions, knowledge transfer workshops, and actionable insights for future investments.

As an overall summary: out of all 30 technology transfer activities in the RoboDemo project, 18 resulted to a preliminary plan to invest in robotics or automation during the next five years, 6 rose the interest towards exploring options, and 6 did not result into near future plans at the moment.

Finland

Case 1

Industry:
Boat manufacturing industry

Approximate size:
medium

Challenges identified:
Manual labour in cutting and trimming the glass fibre parts. Trimmed pieces are complex.

The working positions are unergonomic, and the work itself is dusty and unhealthy, when done manually with hand tools.

Challenge(s) addressed:
Creating a reference solution of a production cells for trimming the parts with robots.

Method of technology transfer used in the case:
Simulation.

Findings:
Two robots on two linear tracks can work simultaneous with one large work piece in trimming.

Smaller work pieces can be trimmed on rotary tables and cutting jigs in separate trimming chambers.

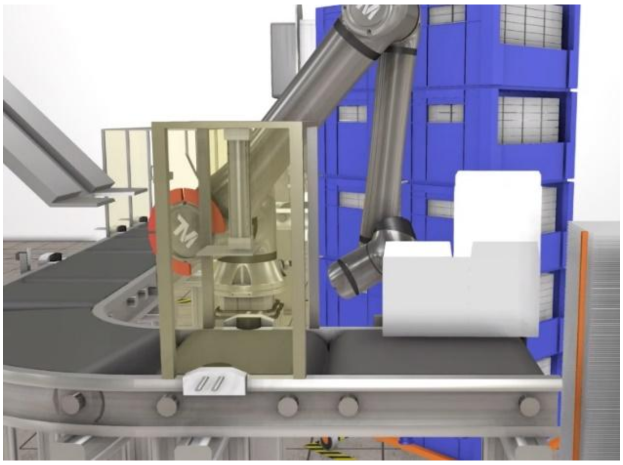
With doors on both sides of the trimming chambers, the pieces can be safely exchanged within these chambers during the trimming of other parts either in chambers or on the linear tracks.

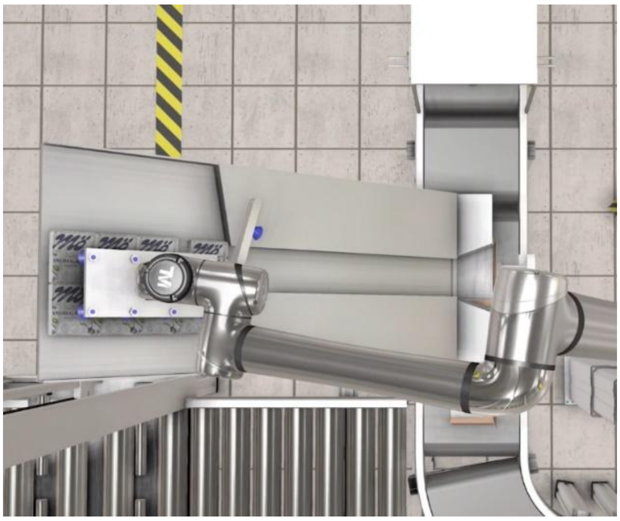
Feedback from the enterprise:
Simulation was presented to the case company by the experts of the partner and it was found interesting.

Outcome:
The industry is struggling after COVID-years and the war in Europe and their effects on global markets. This is why the solution was not adopted in this phase.

Link to the demonstration video:
https://youtu.be/V9-snDbMbqw

Case 2





Industry:
Food industry (dairy-like oat products)

Approximate size:
micro

Challenges identified:
Manual labor in packing the products into boxes for transportation.

Palletising the packed products.

Challenge(s) addressed:
Creating a reference solution of a packing cell with cobots.

Method of technology transfer used in the case:
Simulation

Findings:
The packing process of these products can be automised on a quite high level.

Feedback from the enterprise:
”Hankkeesta teki erityisen mielenkiintoisen se, että se oli puhtaasti meidän tarpeeseen räätälöity ja hyvin konkreettinen. Kaiken kaikkiaan oikein inspiroivaa ja eteenpäinkatsovaa!”

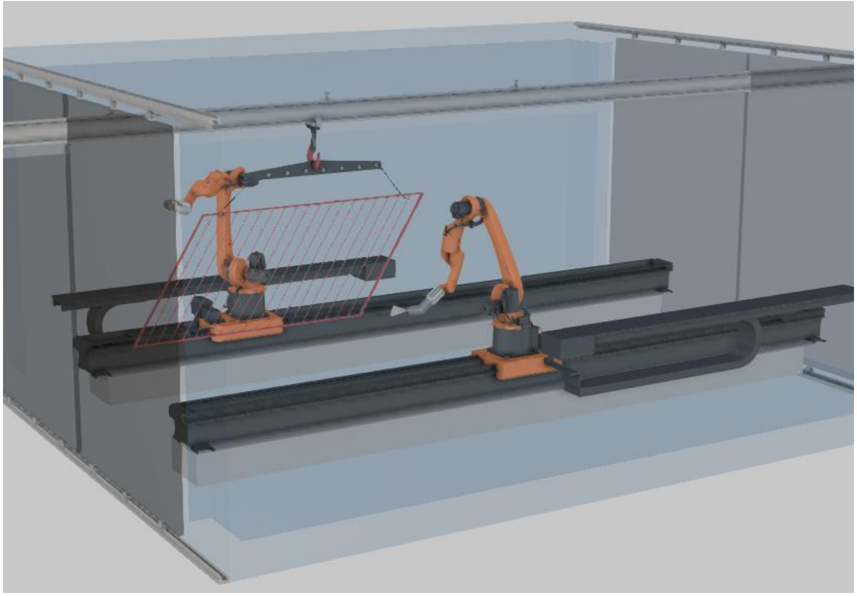
(What made the project particularly interesting was that it was tailored to our needs and very concrete. All in all, very inspiring and forward-looking!)

Outcome:
The company found the solutions interesting, but no immediate investments were made.

Feedback from the company at the end of the RoboDemo project: ”Meillä on suuria kasvuvaiheita tällä hetkellä edessä ja investointisuunnitelmat käynnissä. Varmuutta ei vielä ole mihin loppukokonaisuuteen päädytään, mutta kyllä tässä katsotaan myös automaatiota ja robotiikan käyttöönottoa yhtenä vaihtoehtona. Näillä näkymin suunnitelmat ovat kasassa loppuvuoteen mennessä ja ensivuoden puolella päästään aloittamaan toteutuksia. ” (We are currently facing major growth phases and have investment plans underway. There is no certainty yet about the final outcome, but we are definitely considering automation and the adoption of robotics as an option. As things stand, the plans should be finalized by the end of the year, and implementation can begin next year.)

Link to the demonstration video:
https://youtu.be/OjUejayfOBE

Case 3



Industry:
Metal products powder coating

Approximate size:
micro

Challenges identified:
Manual labour and skill shortage in painting and coating the metal parts.

Challenge(s) addressed:
Creating a robotized and automated painting and coating process for the reference.

Method of technology transfer used in the case:
Simulation

Findings:
Two robots on linear tracks one on each side of the part can work simultaneously to coat the part from both sides.

Feedback from the enterprise:
A demonstration of the simulation was presented to the company, and they found the concept very favourable and useful for planning the investments.

”Hankkeen aikana sain paljon uutta tietoa robotiikasta sekä sen mahdollisuuksista. Asiantunteva tiimi tunnisti tarpeet ja loi virtuaalisen mallin toimivasta konseptista, jota pystyn tulevaisuudessa hyödyntämään.” (During the project, I gained a lot of new knowledge about robotics and its potential. The expert team identified my needs and created a virtual model of a working concept that I can use in the future.)

Outcome:
The solution was not adopted because of the need for bigger space. The company is planning to shift to a new and bigger compound and then they will invest in an automatized solution.

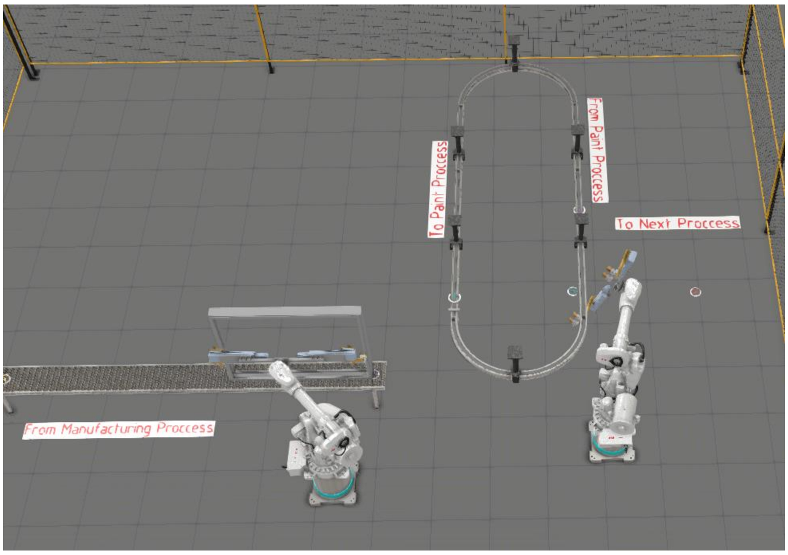
Link to the demonstration video:
https://youtu.be/4Rd8ZrA1_5Q

Case 4

Industry:
Wood products (doors/windows)

Approximate size:
large (case scalable for other actors in the industry)

Challenges identified:
Physically demanding and unergonomic loading and unloading of large and heavy parts. Wide variations in size and weight challenges a common handling tool design.



Challenge(s) addressed:
A robotic handling cell with a versatile tool which caters to almost 80 % of the SKUs by handling anything between size range of 950–2500 mm with same frame profile.

Method of technology transfer used in the case:
Simulation

Findings:
Robots with custom designed hand tool can be deployed for material handling and can handle almost 80% of the SKUs and a major chunk of the production volume.

Feedback from the enterprise:
”Hanke on tuonut lisävarmuutta siitä, että olemassa olevat ajatukset on mahdollista toteuttaa. On saatu uutta tietoa mahdollisuuksista ja toisaalta rajoituksista, joita automatisointiin liittyy. Hanke on antanut uskoa lähteä kartoittamaan rohkeammin robotiikan ratkaisuja linjalle.” (The project has increased confidence that existing ideas can be implemented. It has provided new knowledge about both the opportunities and the limitations associated with automation. The project has also inspired a more courageous approach to exploring robotic solutions for the production line.)

Outcome:
No immediate actions, investments are expected within the next two years.

Link to the demonstration video:
https://youtu.be/1byQQhx1i6I

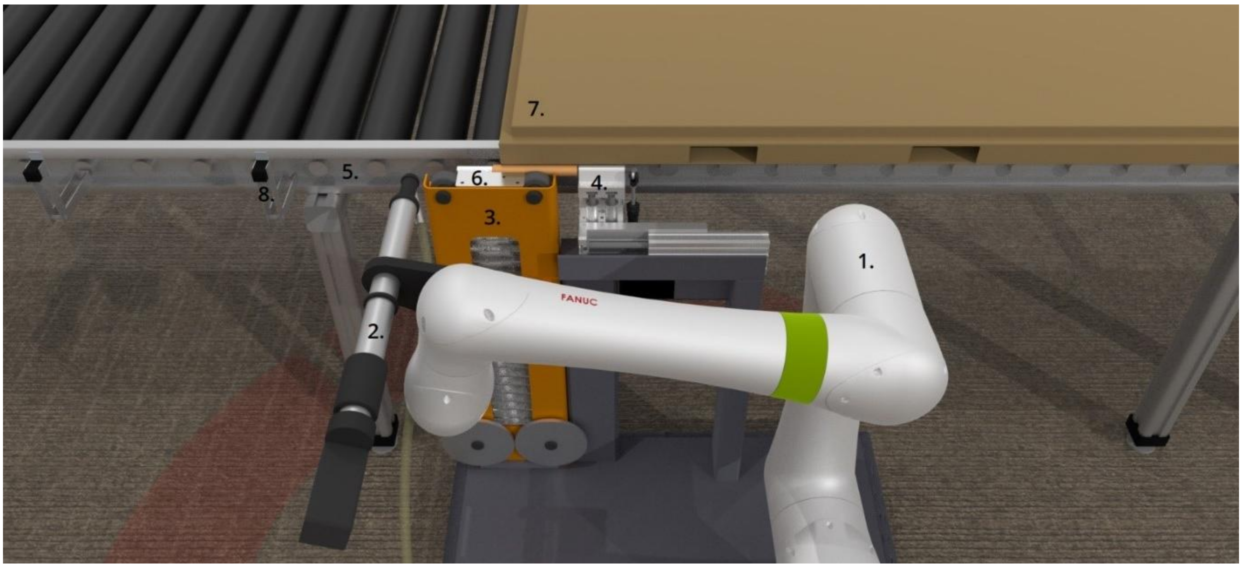
Case 5

Industry:
Wood products (doors/windows)

Approximate size:
large (case scalable for other actors in the industry)

Challenges identified:
Repetitive work.

Challenge addressed:
Robotized installing of door hinges.



Method of technology transfer used in the case:
Simulation. Shown in picture, there is a cobot (1), screwdriver (2), a magazine for the hinges (3), a device for placing the hinges (4), a conveyor (5), a hinge (6), a door (7) and optical sensor (8).

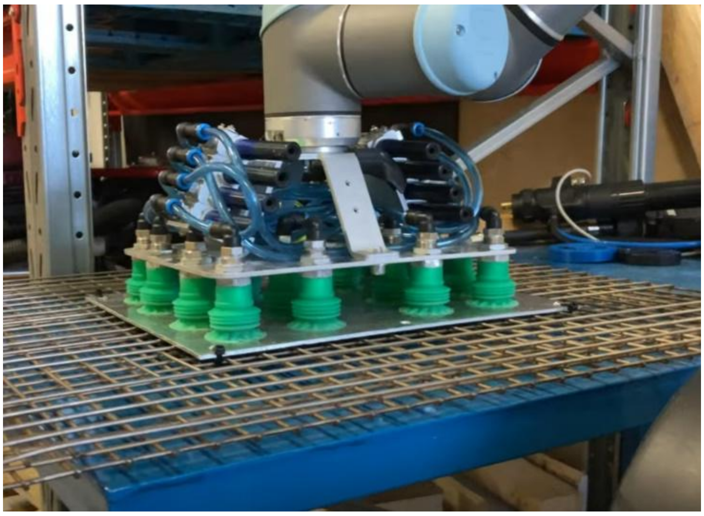
Findings:
Robotized install of hinges can lower the load of the employees which can raise the throughput on the factory. Approach taken does not remove the need for an operator at the factory. There will always be a need for filling the magazines with new hinges, placing the magazine to the screwing station, ensure there are enough screws in the feeder pool and placing the doors on the conveyor.

Feedback from the enterprise:
See the feedback on Case 4.

Outcome:
No immediate actions, investments are expected within the next two years.

Link to the demonstration video:
https://youtu.be/Oz01L94st-U

Case 6



***Industry**:*
Food industry (pre-cooked home meals)

***Approximate size**:*
medium

Challenges identified:
The used cobot used two different grippers, which slows down the process, as the weight of the grippers takes approximately 60 % of cobots payload.

Challenge(s) addressed:
The use of only one gripper instead of two.

Method of technology transfer used in the case:
Demonstration

Findings:
With some adjustments on the mesh used in between the product layers only one gripper is needed. For this, small metallic plates are welded on the mesh.

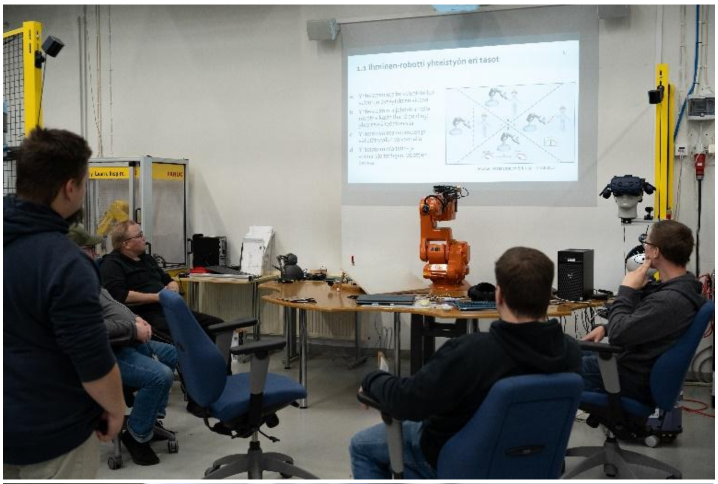
The team also tested moving the mesh with various speeds and found out that even high speeds can be used in the process.

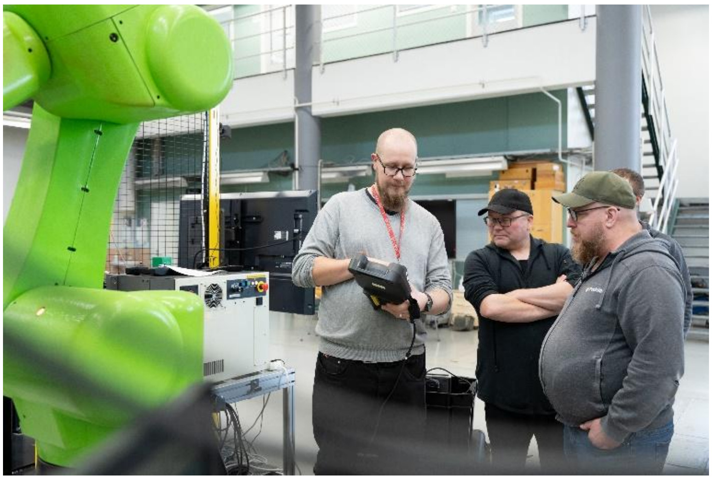
Feedback from the enterprise:
The solution was found interesting, but not feasible at this point. Plates welded to mesh needs more studying in terms of effect in cooking process.

Outcome:
No new investments were made. This suggestion was made for improvement of the process, which was taken under consideration at the company. The SME was suggested a workshop on cobot programming (see the case 7).

Link to the demonstration video:
https://youtu.be/jxAudQIGNfs

Case 7





Industry:
Food industry (pre-cooked home meals)

Approximate size:
medium

Challenges identified:
No know-how on cobot programming. The SME is fully dependent on the system integrator in even smallest of malfunctions.

Challenge(s) addressed:
Improving knowledge on how to program the cobots.

Method of technology transfer used in the case:
Workshop - A brief introduction to the cobot programming. Getting root level knowledge how cobots operate and how they can be programmed. Critical part of workshop was informative part of cobot regulations and standards telling what is actually a cobot.

Findings:
Not applicable in a workshop

Feedback from the enterprise:
"Yhteistyö on ollut mutkatonta ja sujuvaa." (The collaboration has been smooth and effortless.)

Outcome:
The workshop gave insights for the personnel of how to utilise their existing equipment in the best possible way.

Link to the demonstration video:
https://youtu.be/-smxj35wMSU

Case 8

Industry:
Welding of stainless steel and other metal products

Approximate size*:*
small

Challenges identified:
Company has adopted high volume production of welding flexible pipe pieces size variation between 200–2500 mm. All welding is done by hand. Company is looking for reliable welding method for robotic welding

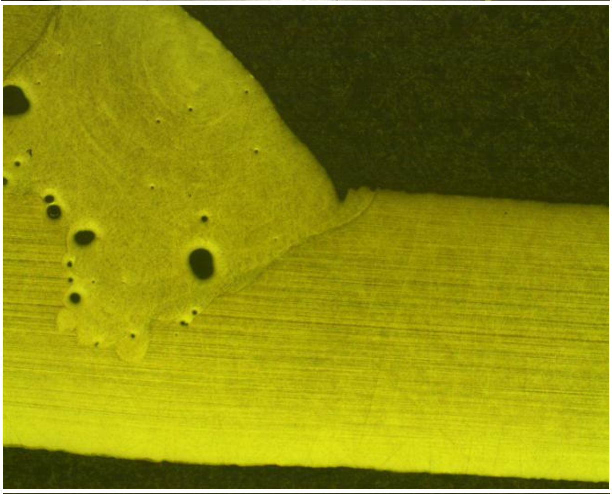
Challenge(s) addressed:
Repetive work on difficult positions.

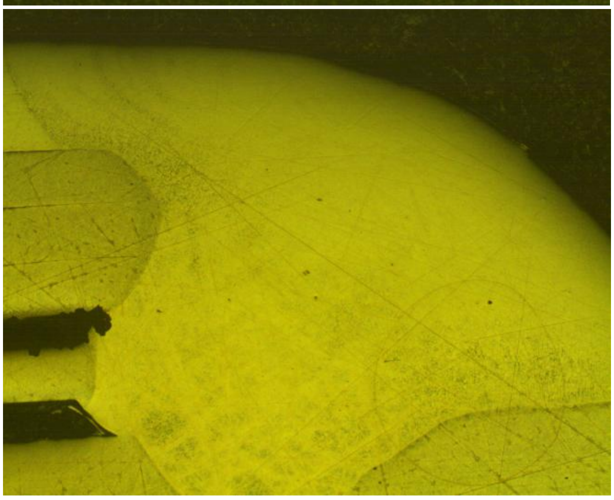
Method of technology transfer used in the case:
Demonstration and testing on ABB industrial robot and different welding methods and parameters.

Findings:
In this welded piece the structure of flexible pipe is in big role. In testing, CMT-welding was not suitable for this multilayer thin sheet piece, but with correct gas and parameters basic MAG-welding gave most reliable results in term of integrity of weld.

Outcome:
This case's welding job is a simple path, so robotic solution is not feasible for this case. Simple automatic torch and jig with rotating table will do this repetitive task well.

Link to the demonstration video: https://youtu.be/q5GgftmDlQw





Case 9

Industry:
Wood products (lathe products)

Approximate size: small

Challenges identified:
Repetitive work

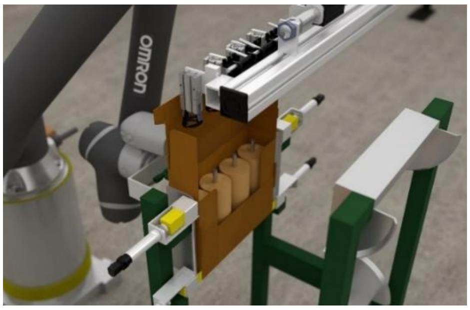
Challenge addressed:
Using two cobots and a jig to erect a box and pack the products coming from painting line. Picking the products from the painting line needs specially crafted gripper that can pick four products and place them in the box. Products coming out from the painting line have 250 millimeter gap between each other while in the box they are located next to each other, so the gripper needs to have a mechanism which can slide the products closer to each other horizontally.

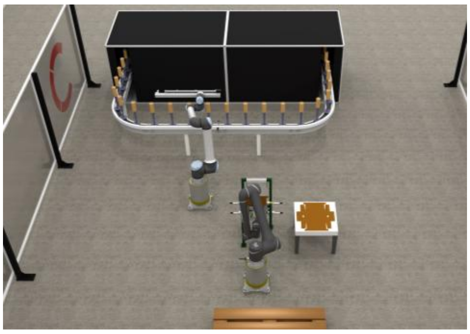
Method of technology transfer used in the case:
Simulation for the whole packaging process and a real world demonstration for the box erecting part of the process.

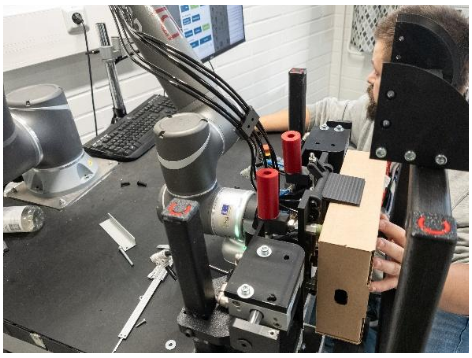
Findings:
Box type the company uses is not optimal to be erected by a robot. There are better alternatives which do not need a supportive jig.

Feedback from the enterprise:
"Yhteistyö sujui mallikkaasti." (The collaboration proceeded excellently.)

Outcome:
This demonstration was made in such a late stage of the RoboDemo project, the company did not have plans yet.



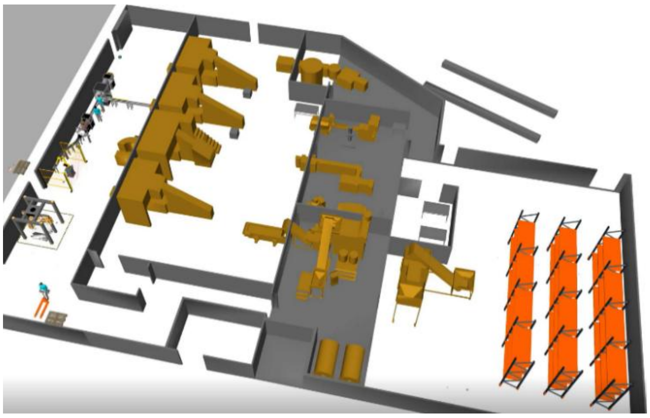


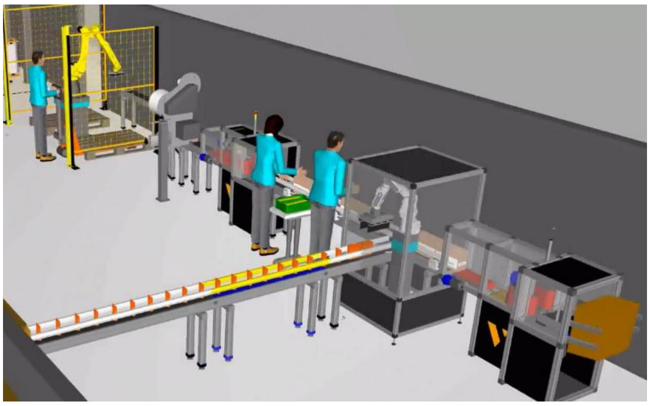


Links to the demonstration videos:
https://youtu.be/F5BIATtC23s
(simulation)
https://youtu.be/eRhyYZHu-GM
(cobot demonstration)

Ireland

Case 10





Industry:
SME food company which specialises in the manufacturing of healthy snacks and food toppings.

Approximate size:
small to medium enterprise with growing sales.

Challenges identified:
The process is physically demanding, particularly in the packing area where palletising the products presents ergonomic challenges. The company's production lines are highly labour-intensive, with no automation currently implemented, making RoboDemo an ideal solution for this facility.

Challenge(s) addressed:
The primary area to address is the packaging section of production, specifically focusing on boxing the product, palletising, and pallet wrapping. These areas are often an ideal starting point for automation, given the wide range of solutions available on the market.

Method of technology transfer used in the case:
Simulation conducted using Visual Components software. These simulations demonstrated efficient floor layouts for the company's manufacturing site as seen in the image below.

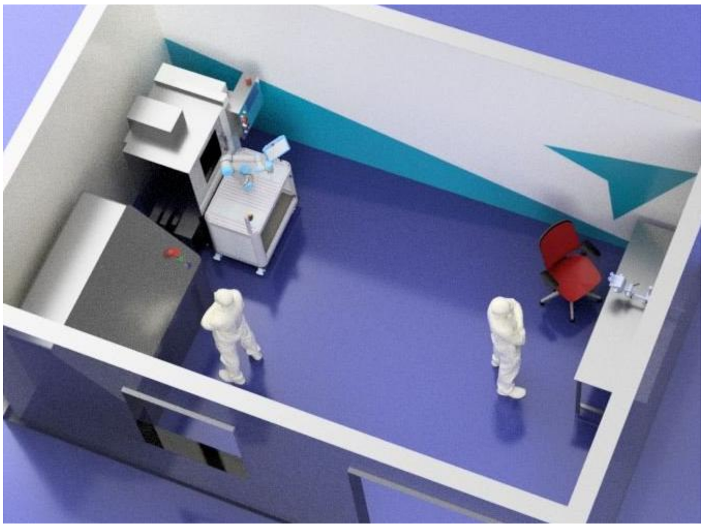
Findings:
An automated production line to support product packaging can be implemented. This line will include two robots—one for boxing and another for palletising—along with conveyors, a box-making machine, a labelling machine, a case-sealing machine, and a pallet wrapper.

Feedback from the enterprise:
The company has affirmed its commitment to progressing with automation and has already initiated an investment process with support from Enterprise Ireland. They view this project as a strategic step toward strengthening capacity, improving reliability, and future-proofing their operations as production volumes continue to grow.

Outcome:
The company is exploring automation technologies in greater depth, considering various options to enhance efficiency and capability. The company is continuing with the project with the support of Enterprise Ireland funding. We considered various scenarios of investment and conducted feasibility study and financial appraisal, and the company has chosen the best option to invest and continue on with Enterprise Ireland funding.

Link to the demonstration video:
https://youtu.be/bvwsD_yUtZ0

Case 11



Industry:
Tool making sector having recently expanded into contact manufacturing of medical device components.

Approximate size:
medium sized business

Challenges identified:
With the anticipated increase in demand, automation has become necessary to address rising labour costs and the ongoing labour shortage. The company must reduce costs and scale production volume to meet its revenue targets effectively.

Challenge(s) addressed:
Given the labour-intensive nature of certain tasks within the business, automation presents a highly viable opportunity. Machine tending was recognised as the most strategic opportunity for robotic integration at the time, offering significant potential to enhance growth, quality, and efficiency in alignment with the company's objectives.

Method of technology transfer used in the case:
Simulation

Findings:
The proposed solution involves deploying a collaborative robot to handle CNC machine tending, incorporating a vision system for enhanced accuracy and efficiency through vision inspection. The tasks included performing simulations, delivering a proof of concept, and evaluating the business case to assess return on investment (ROI).

Feedback from the enterprise:
"AIM team made great effort in looking at the potential robotic application. We are extremely happy with the outcome. AIM team provided us with comprehensive insights to make informed decision moving forward." James Lawrence

See the full testimonial:
https://youtu.be/e_vkTVMtl7o

Outcome:
AIM considered various scenarios of investment and conducted feasibility study and financial appraisal, and the company will collaborate with the integrator company and Enterprise Ireland.

Link to the demonstration video:
https://youtu.be/PlosUgreUXo

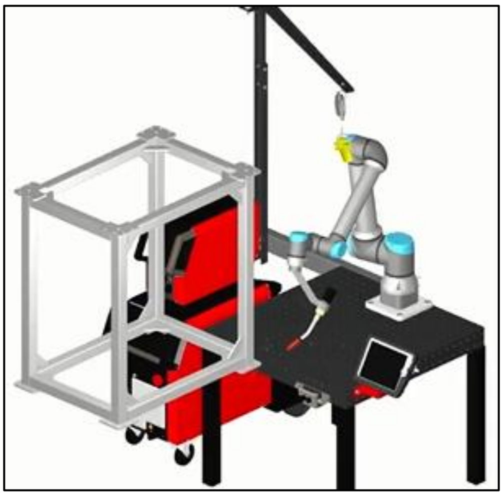
Case 12

Industry:
Sheet Metal Fabrication company

Approximate size:
SME with approximately 20 employees

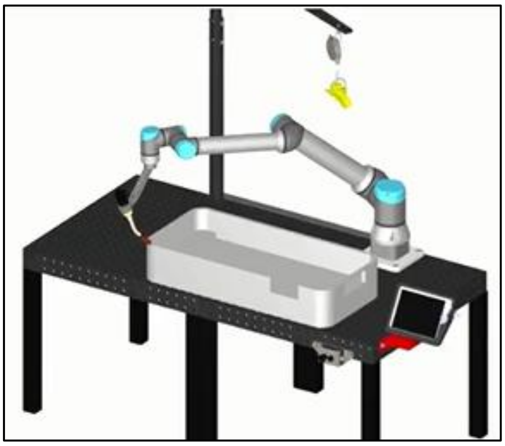
Challenges identified:
The primary challenge encountered by the company was securing skilled labour, particularly welders.

Challenge(s) addressed:
Given the shortage of skilled welders, a robotic welding system presents an ideal alternative solution. Due to the small batch sizes of the companies' products and parts a collaborative robotic welder is the most viable solution with its ease of programming. The images represent the design concepts developed during this project.



Method of technology transfer used in the case:
Simulation

Findings:
Collaborative robotic welders will not completely replace skilled welders but will alleviate their workload by managing routine tasks, thereby enhancing overall efficiency. This approach is viable for repeat manufacturing scenarios.



Feedback from the enterprise:
The company expresed strong appreciation for the simulation-based approach used during the project. They noted that the visualisation of the robotic welding concepts provided a much clearer understanding of how collaborative welding technology could be integrated into their existing workflow. They stated that while they recognise the value the robotic system could bring in reducing repetitive welding tasks and improving efficiency, further internal assessment is required before moving toward adoption. They found the study and recommendations highly beneficial and intend to use the outputs to support future investment planning.

Outcome:
AIM considered various scenarios of investment and conducted feasibility study and financial appraisal. The company was presented with a simulation demonstration, which they found to be highly beneficial and well-suited for supporting their investment planning. The company have not yet adopted the solution.

Link to the demonstration video:
https://youtu.be/JQwvyGPnGZo

Case 13

Industry:
Metrology Company providing metrology fixtures and measurement services for the MedTech sector.

Approximate size:
SME

Challenges identified:
The workshop floor was designated as the primary focus for robotics integration due to the high frequency of manual machine-tending tasks. These processes required an operator or technician to manually load individual components into the Coordinate Measuring Machine (CMM) for measurement. The components were typically retrieved from bulk packaging, such as boxes or bins.

Challenge(s) addressed:
Due to the variability in the positioning of products within bulk packaging, the implementation of a 3D vision system along with an automated part feeder will be necessary to accurately identify and facilitate the picking of individual items effectively. Flexible vacuum cups will be utilised to facilitate the handling and positioning of components presented in varying orientations and positions. The below images illustrate the design concept proposed by AIM to the customer. This solution is designed to be transferable between CMM machines, enabling seamless adaptability for use with a range of products.

Method of technology transfer used in the case:
Simulations of various design concepts.

Findings:
The return on investment (ROI) for this technology is anticipated over a longer timeframe due to the higher upfront capital investment. However, this solution offers the opportunity to streamline operations by allowing technicians to focus on more critical and complex tasks, contributing to time savings and improved efficiency for the organisation.

Feedback from the enterprise:
The company were very happy with RoboDemo as outline in the testimonial video. "--they helped us scope out the project, which then helped with forming the URS that we went to tender with. It was a very inclusive process, we were part of it all the way through and we are looking forward to working with the team as the project progresses." Andrew Hodson, Managing director.

Outcome:
AIM considered various scenarios of investment and conducted feasibility study and financial appraisal. The company intend to move forward with R&D looking deeper into robotics for similar applications.

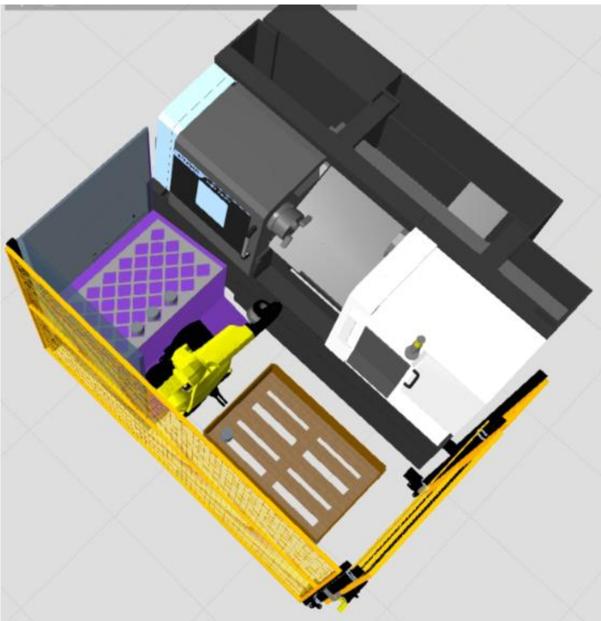
Link to the demonstration video:
https://youtu.be/2pOEanwGJag

Case 14

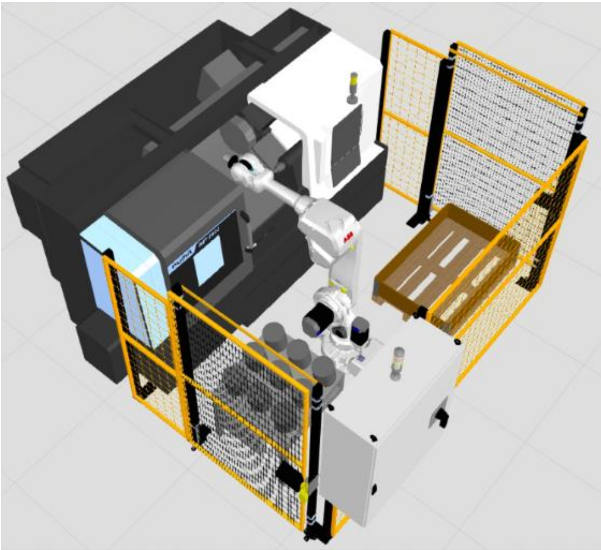
Industry:
Precision Engineering

Approximate size:
SME

Challenges identified:
Machine tending is one of the most labour-intensive tasks in the workshop, yet it is a relatively straightforward process to automate. Given the limited availability of operators to support machine tending, implementing a robotic solution would help optimise resources and enable skilled labour to focus on more specialised tasks.



Challenge(s) addressed:
The images below depict the concepts presented and demonstrated to the company. The image on the left illustrates the proposed concept, featuring a table design that integrates the robot, controller, and electrical cabinet. This setup enables the processing of various products, with simple changeovers to accommodate steel billets of different diameters.



Method of technology transfer used in the case:
Simulations of design concepts

Findings:
The company gained insights into various robot and cobot technologies that can be integrated into their workshop to optimise production. These technologies are designed to improve throughput on machines and reduce downtime on CNC lathes through robotic machine tending and other automation solutions.

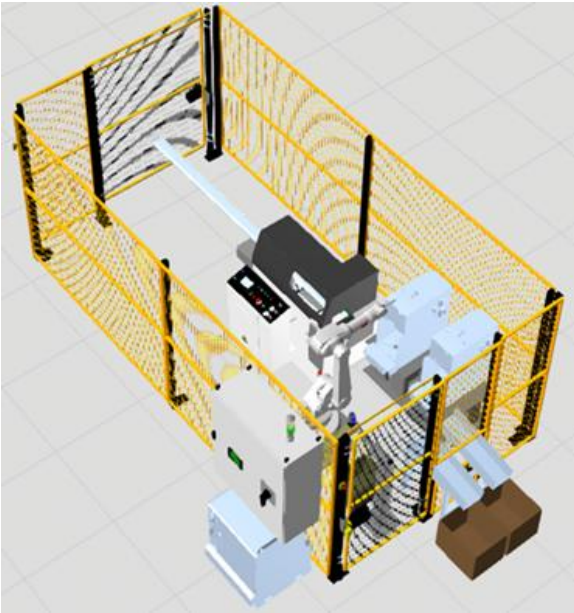
Feedback from the enterprise:
"With the assistance of the AIM team, we were able to define a tailored robotic CNC machine tending solution that best aligns with our company's needs. This collaboration provided us with a deeper understanding of robotics and its potential to enhance our operations and improve production efficiency."

Outcome:
The company is collaborating with vendors to design and develop a machine based on the concept above, with plans to adopt the technology in the near future.

Link to the demonstration video:
https://youtu.be/xN6t-8f0bWg

Case 15

Industry:
A manufacturing company specialising in the production of rainwater management systems.



Approximate size:
medium

Challenges identified:
The company faced labour shortages across the plant, particularly for high-risk tasks in a noisy environment. The punching process was identified as the most suitable for automation due to its high volume and repetitive nature. The process involves the operator transferring a part from a tote to a press machine, activating the press, and then placing the finished product into a box, making it ideal for automation.

Challenge(s) addressed:
An automated punching solution can help to reduce labour requirements within the factory. A robotic system will replace the operator's pick-and-place function. By positioning the robot and press machine adjacent to the saw, a fully enclosed robotic cell can be established, ensuring safety by isolating all hazardous machinery. The CAD screenshots below illustrate the proposed design concept, optimized for the company's application. The robot's workflow involves picking the cut bracket from the saw, transferring it to the punching station, activating the press, positioning the bracket under a vision system for inspection, and subsequently placing it onto the parts-out chute.

Method of technology transfer used in the case:
Simulations of design concepts

Findings:
The return on investment (ROI) for this solution is substantial, making it a highly effective means of improving factory efficiency and boosting production. Additionally, the integration of the vision system will enhance quality control within the plant.

Feedback from the enterprise:
The company expressed strong interest in the proposed automated punching solution and acknowledged the potential benefits it could deliver across safety, efficiency, and quality. They noted that the simulations and design concepts provided valuable clarity on how a robotic system could be integrated into their production workflow, particularly given the high-risk nature of the current manual process.

Outcome:
The company is undertaking a comprehensive evaluation of automation strategies across the facility to optimise productivity. AIM has conducted feasibility and financial analyses for multiple investment scenarios and is currently requesting quotations from automation integrators. Additionally, cost-effective machine-level upgrades are being explored to enhance process quality and operational efficiency.

Link to the demonstration video:
https://youtu.be/9yUcZmGSBE8

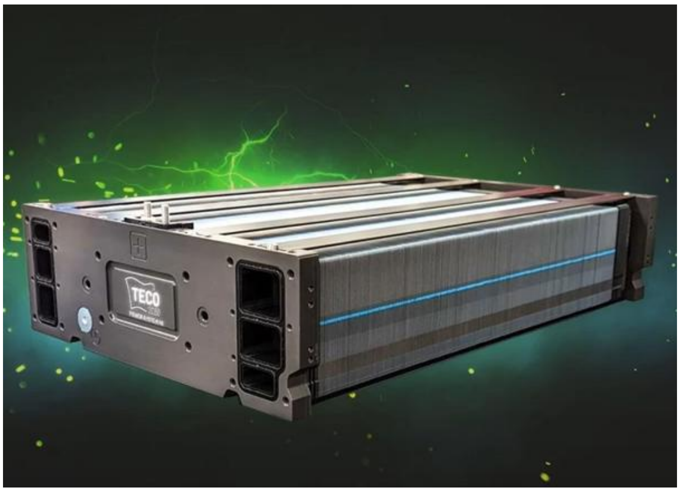
Norway

Case 16

Industry:
Fuel cell stacking

Approximate size:
small

Challenges identified:



Fuel cells are manufactured in the form of modules, often scalable, at the heart of which are multiple stacks that generate the power. Fuel cells perform best when the stack is uniform. Conversely, fuel cell stack performance is limited by the performance of the weakest cell in the stack. Hence, standard operating procedures that ensure quality control in the stacking process are of critical importance. Hydrogen fuel cells may suffer drastic decrease in performance due to several causes, some of which include stacking defects, contamination, unstable catalyst or polymer, mechanical stresses, thermal effects etc. This makes it important to look closely into the stacking process and establish best practices that ensure high reliability of the process. Integrating lean techniques into the stacking process aids in reducing process waste and non-value-added activities, which improves process flow and reduces inventory. Therefore, it is important to look at the internal logistics flow and process parameters for the stacking process to enable a stable and capable stacking process with balanced flow and effective customer pull.

Industrial scale production of hydrogen fuel cells is a hotspot of academic and industrial research today. The assembly process of stacking and module assembly define the quality of the final product, whereas the activities within the stacking process and the module assembly process define the quality of each of these two processes.

Challenge(s) addressed:
This project aims to study the PEMFC stack assembly process by defining and investigating key performance indicators to evaluate the performance of the stack assembly line design and suggest measures to improve the flow and reduce waste in the process by application of lean concepts and tools.

Method of technology transfer used in the case:
Report with suggested process flow and operator utilization. Oral presentation in Narvik.

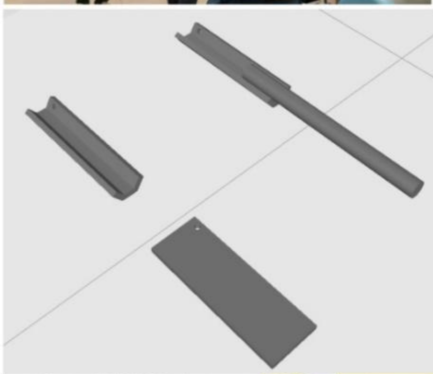
Findings:
Overall, the study conducted for this project accomplished the objectives and answered the research questions that were posed at the beginning. Quantitative results were linked to qualitative interpretations through the effective use of data visualization. However, certain assumptions were also listed at various points. One of the most important assumptions was that there are no breakdowns of machines or errors/reworks in the finished work items. This assumption helped to set up a reference model which represented the maximum performance at ideal conditions. Such a model serves as a benchmark for the company and provides a point of reference for all key performance indicators and provides motivation for continuous improvement and to make the effort of achieving better and better results. It cements the central notion of lean that lean is not a point which can be achieved with finite effort, but it is rather a journey. A journey not from A to B, but from A to infinity, since in the terminology of lean, there is no such concept as perfection, but only continuous improvement.

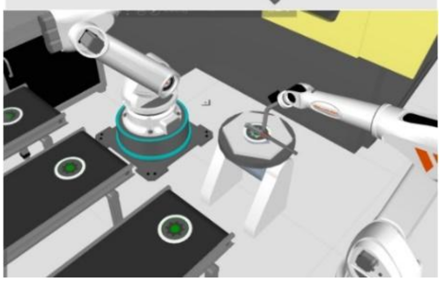
Feedback from the enterprise:
As requestor for this study, we had great pleasure of working with the candidate. Being a company in a startup phase we clearly saw the benefits of bringing in new eyes and competence to focus on an area which will make a big impact of our success going forward. Limited on resources this gave us an opportunity both to extend our cooperation with the local University resources, but also reduce the pressure on our regular staff. We judge the results from the study as a thorough and valuable analysis which will support us in our further planning and production process.

Outcome:
The company is still undergoing planning of the industrialization of the findings.

Link to the demonstration video:
https://youtu.be/CL65KThso0Q

Case 17





Industry:
Mechanical workshop specializing in solutions for area security like fences, stairs and railings

Approximate size:
small

Challenges identified:
Manual labour related to welding and assembly. Repetitive work tasks with rather heavy workpieces. Need to engage skilled welder in other more demanding welding operations.

Challenge(s) addressed:
Gain knowledge of robots and cobots, programming principles and available simulation softwares. Discuss possible steps and solutions towards a semi-/automatic welding cell.

Method of technology transfer used in the case:
Seminar and training, tech workshop with other companies, university researchers and a system integrator (e.g. machine builder).

Findings:
Company got insight in the possible cobot/robot technologies and principles applied when designing an assembly operation (lectures). An initiary simulation was set-up in order to show the capability of simulation softwares.

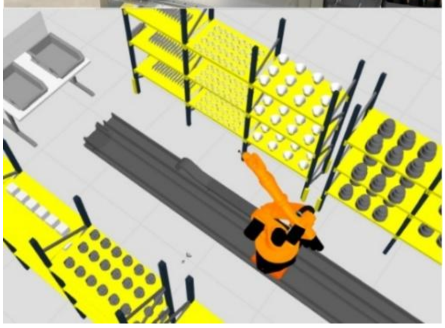
Feedback from the enterprise:
The company chose not to implement the cobot solution, at this time. The cost-benefit-ratio, is not good enough, due to the low number of yearly units produced. This can however change if the numbers pick up. "Working with the university has been a pleasure, and is something we like to do again."

Outcome:
The company continues its work together with a relevant system integrator, targeting towards a possible cobot installation. The company has further been engaged in, and got funding for, a new project with the purpose to include cobots in the manufacturing processes.

Feedback after approximately one year from demonstration:
University partner UIT participants in newly established Cobot project.

Link to the demonstration video:
https://youtu.be/Hbg05NB7dQI

Case 18



***Industry**:*
Mechanical factory, assembly operations

***Approximate size**:*
small

Challenges identified:
Manual labour in picking and kitting prior to product assembly. Un-structured picking area needs storage solution and possible automatic picking operation.

Challenge(s) addressed:
Gain knowledge of robots and cobots, programming principles and available simulation softwares. Discuss possible steps and solutions towards a semi-/automatic picking storage and station.

Method of technology transfer used in the case:
Seminar and training, tech. workshop with other companies, university researchers and a system integrator (e.g. machine builder).

Findings:
Company got insight in the possible cobot/robot technologies and principles applied when designing an assembly operation (lectures).

The picking and packing process of these products can be automized to quite a high degree, but will require quite substantial investments.

Feedback from the enterprise:
"Through this collaboration with the university and other companies, we had the opportunity to view the challenge we are facing from different perspectives. It was especially insightful to learn how the future of manufacturing is being shaped by technological innovations such as digital twins and simulations, modular manufacturing etc. And we believe these kinds of collaborations between research institutions and businesses is mutually beneficial."

Outcome:
The company continues its work together with a relevant system integrator, targeting towards a possible cobot installation. The company has further been engaged in, and got funding for, a new project with the purpose to include cobots in the manufacturing processes.

***Feedback after approximately one year from demonstration**:*
University partner UIT participants in newly established Cobot project. The company and UiT has cooperated on a bachelor in engineering thesis related to a manufacturing cell at the factory.

Link to the demonstration video:
https://youtu.be/lhpB0GpJMtw

Case 19

Industry*:*
Manufacturer of equipment for water infrastructure, e.g pipelines, tanks, culverts etc.

Approximate size*:*
small

Challenges identified:
Manual heavy-duty welding of large plastic pressure pipelines.

Challenge(s) addressed:
Gain knowledge of robots and cobots, programming principles and available simulation softwares. Discuss possible steps and solutions towards a semi-/automatic welding station.

Method of technology transfer used in the case:
Seminar and training, tech workshop with other companies, university researchers and a system integrator (e.g. machine builder).

Findings:
Company got insight in the possible cobot/robot technologies and principles applied when designing an assembly operation (lectures).

An automatic robotized welding process was discussed among seminar partners. The company will further develop a solution in cooperation with a system integrator.

Feedback from the enterprise:
"The seminar was valuable for us as it gave us the opportunity to have our case discussed together with UIT Narvik's academia team. The value of this is significant and we look forward to continuing the collaboration with UIT Narvik and Bjørn Solvang."

Outcome:
The company continues its work together with a relevant system integrator, targeting towards a possible cobot installation. The company has further been engaged in, and got funding for, a new project with the purpose to include cobots in the manufacturing processes.

Feedback after approximately one year from demonstration*:*
University partner UIT participants in newly established Cobot project.

Link to the demonstration video:
https://youtu.be/Zmn2C2u4S1o

Case 20

Industry:
Manufacturer of various plastic products

Approximate size:
small

Challenges identified:
Discussion on an automatic top-coating station for plastic products. High-precision operation controlling the thickness of the coat at all parts of the product.

Challenge(s) addressed:
Company is experienced with cobot/robot technologies but wants to further discuss possible steps towards a new automatic coating station, including automatic feeding of the cell (e.g automated/intelligent guided vehicles)

Method of technology transfer used in the case:
Seminar and training, tech workshop with other companies, university researchers and a system integrator (e.g. machine builder).

Findings:
Company got some further insight in the robot technologies and principles applied when designing an automatic operation (lectures). A robotized coating process was discussed among seminar partners. The company will further develop a solution in cooperation with a system integrator.

Feedback from the enterprise:
The seminar was very useful for us as we had the opportunity to discuss our case with the expert team assembled by Bjørn Solvang at UIT Narvik. We clearly see the value of bringing academia and businesses closer together in projects like this. We look forward to continue collaboration in future projects.

Outcome:
The company continues its work together with a relevant system integrator, targeting towards a possible cobot installation. The company has further been engaged in, and got funding for, a new project with the purpose to include cobots in the manufacturing processes.

Feedback after approximately one year from demonstration:
University partner UIT participants in newly established Cobot project.

Link to the demonstration video:
https://youtu.be/Zmn2C2u4S1o

Case 21

***Industry**:*
Design and manufacturing of eyeglasses

***Approximate size**:*
small

Challenges identified:
New manufacturing and market opportunities through emerging digital technologies, e.g. 3D-printing technologies.

Challenge(s) addressed:
Gain knowledge of design principles, materials and selected software solutions for lightweight constructions.

Method of technology transfer used in the case:
Seminar and training, tech. workshop on relevant hardware and software solutions. Insight in manufacturing processes and choice of materials.

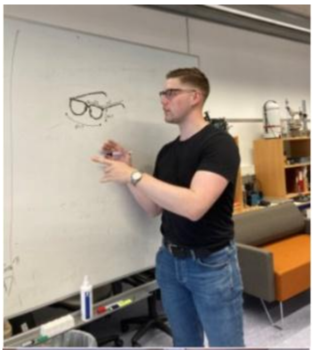
Findings:
Company got insight in a possible manufacturing system for a new product series through lectures and dedicated laboratory training.

Feedback from the enterprise:
Seminar turned out exactly as wanted. Company was very satisfied with the activities and outcome of our cooperation.

Outcome:
No. The company is investigating further possibilities for development and investment of a new manufacturing system.

***Feedback after approximately one year from demonstration**:*
Company and UIT are considering joint research opportunities as well as collaboration on student projects.

Link to the demonstration video:
https://youtu.be/iFCMeNzuW3s



Case 22

***Industry**:*
Design and manufacturing of tools for aviation drones

***Approximate size**:*
small

Challenges identified:
Expensive and labour-intensive manufacturing processes.

Challenge(s) addressed:
Gain knowledge and insight in emerging manufacturing technologies and software tools in order to optimize design for manufacturing. Cobot technology, and assembly systems including available software solutions.

Method of technology transfer used in the case:
Seminar and training, technology workshop on relevant hardware and software solutions. Product portfolio discussion on design and manufacturing principles.

Findings:
Discussion on possible manufacturing and design optimizations. Introduction and training towards cobots and manufacturing simulation softwares.

Feedback from the enterprise:
"The workshop provided valuable insights into how we should approach the gradual transition to cobot solutions. As our production volume increases, implementing cobots to handle time-consuming tasks will be essential to maintaining efficiency and cost-effectiveness. We are commit-ted to keeping our production local, but to achieve this without the costs associated with a high number of manual labor hours, we see cobots as a crucial part of our future strategy. The session helped us understand the necessary steps and considerations for integrating these technologies into our processes while scaling production."

Outcome:
The company are mainly focusing on a new product portfolio in order to increase production batch-size.

***Feedback after approximately one year from demonstration**:*
Company and UIT are currently discussing and considering joint research opportunities as well as collaboration on student projects.

Link to the demonstration video:
https://youtu.be/nQanhcRbUuI

Case 23

Industry:
Shellfish processing factory

Approximate size:
medium

Challenges identified:
Labour intensive washing and cleaning procedure of manufacturing equipment. Possible health hazards due to the use of chemicals and exposure to certain aerosols.

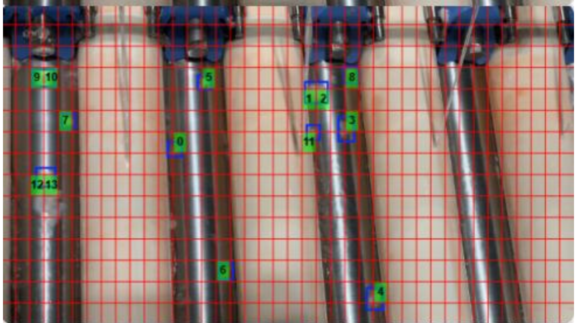
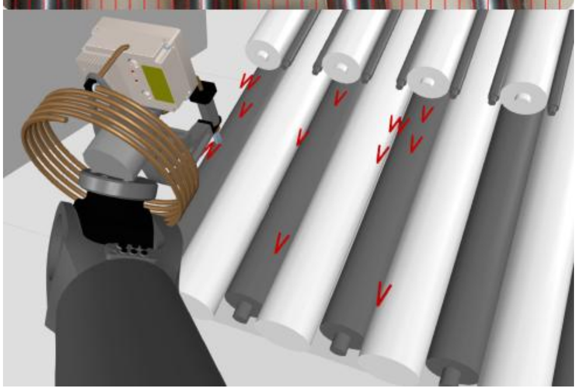
Challenge(s) addressed:
Develop a framework for a new semi-automatic cleaning process. Demonstrate possible solutions through simulations.

Method of technology transfer used in the case:
Demonstration of cleaning system through simulations. Company visits and discussions on available technologies and possible solutions.

Findings:
Company got insight in the possible cobot/robot technologies and principles applied when designing a cleaning system. Keywords robots, vision technologies, machine learning and general system design. Test shows that the machine learning algorithms applied for detecting shrimp-shells was very efficient and well suited for such application area.

Feedback from the enterprise:
"For our company, adopting new technology has been crucial to ensure competitiveness and efficient production. New technology helps secure jobs and create value in the shrimp industry. An efficient peeling process is ensured through equipment that functions optimally. Optimal function requires continuous cleaning of the rubber and steel rollers of the peeling machines throughout the 17 hours of production per day. This is essential for effective production. Today, this cleaning is done manually by the machine operator. Cleaning the eight peeling machines requires time and attention to identifying the areas that need cleaning. Manual cleaning creates aerosols with particles from the shrimp, which can cause negative reactions in the operator's respiratory system. For this



reason, it is desirable to find technology that can replace this manual work. The company has now developed a concept and solution for a cobot/robot automatic cleaning system, presented by the University of Tromsø and the project RoboDemo. For the company the RoboDemo project represents a very interesting concept. Throughout this collaboration with the University, we have taken the first step towards addressing the challenges of keeping the peeling machinery clean through an automated cleaning process. "

Outcome:
The RoboDemo case and proposed solutions were presented to the company in October 2025. The company is very interested in taking the concept further towards the development of an actual co- or robot, and will continue our discussion and cooperation with the University on how to do this, along with seeking cooperation with other system integrators and relevant sub-suppliers.

Feedback after approximately one year from demonstration:
Solution was presented to the company in October 2025.

Link to the demonstration video:
https://youtu.be/t_8dQECCNHQ

Sweden

LTU

Case 24

Industry:
Mining

Approximate size:
Medium

Challenges identified:
Working environment monitoring and actions.

Challenge(s) addressed:
Rock pile detection in mines. Rock falls can occur unpredictably, posing safety risks and requiring immediate inspection and clearance of affected areas. The case explored the use of autonomous robots to inspect drifts, identify rock piles, and detect anomalies that may indicate unsafe conditions.

Method of technology transfer used in the case:
Lab scale data collection, Simulation, learning based decision

Findings:
The case showed that autonomous robots equipped with LiDAR and vision can reliably detect rock piles and other hazards in underground mining environments. Simulations confirmed that robots can navigate unknown areas, recognise dangerous terrain, and support safety monitoring with consistent performance.

Machine-learning-based detection improved robustness in difficult conditions such as dust, low visibility, and irregular surfaces. The work also demonstrated that the same approach can be extended to other inspection and emergency-response tasks, reducing human exposure to risky areas and supporting safer, more efficient mining operations.

Feedback from the enterprise:
Results are shared with company. Communicating for the feedback. Follow-up discussions were initiated to explore further development, on-site testing possibilities, and alignment with the company's long-term roadmap.

Outcome:
The RoboDemo case and proposed solutions were presented to the company in October 2025.

Link to the demonstration video:
https://youtu.be/1B9Mui_xLBM

Case 25

Industry:
Space

Approximate size:
Medium

Challenges identified:
Evaluation of thermal camera, debris detection, observations in space

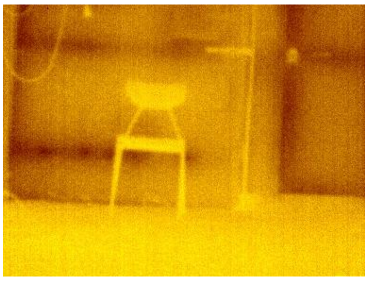
Challenge(s) addressed:
Assessment of a thermal sensor for potential use in space missions. The work focused on sensor interfacing, modelling, and evaluating its capability for detecting and localising space objects.

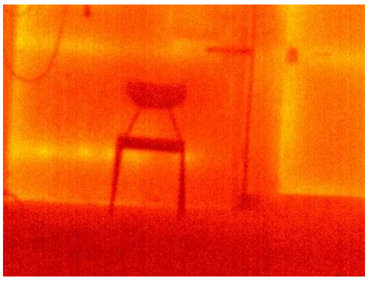
Method of technology transfer used in the case:
Simulation, sensor (hardware) evaluation.

Findings:
The evaluation demonstrated that the SME's in-house–developed thermal sensor performs reliably for space-oriented detection tasks. Controlled experiments conducted in the SubTlab allowed the team to generate a dedicated dataset under varying environmental and emissivity conditions. These tests showed that the thermal camera can successfully distinguish objects even when they share similar temperatures, using differences in thermal emissivity as the key discriminating factor — a capability highly relevant for debris monitoring and object detection in orbit, where lighting and background conditions can be challenging.

Overall, the results confirmed that the thermal sensor technology has strong potential for future applications in space situational awareness, autonomous navigation support, and detection of uncooperative or low-visibility objects. The developed dataset and detection methodology provide a foundation for refining AI-based recognition algorithms in the company's ongoing product development.

Feedback from the enterprise:
The company expressed strong satisfaction with the quality and relevance of the work carried out in the RoboDemo case. They highlighted the value of receiving both a structured evaluation of their thermal sensor and a clear demonstration of its detection capabilities in simulated and controlled laboratory conditions. The dataset generated at SubTlab was particularly appreciated, as it provides a solid basis for advancing their internal development and testing processes.





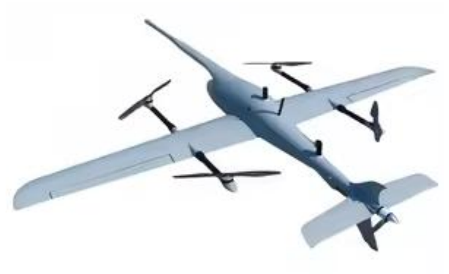
Following the demonstration, the company initiated further in-house experiments and expressed interest in continued collaboration to explore how the findings could support future mission concepts and sensor refinement.

A testimonial was provided by the company and was shared with project leader for reporting.

Outcome:
The company is happy with the demonstration. Following the demonstration, the company initiated further in-house experiments and expressed interest in continued collaboration to explore how the findings could support future mission concepts and sensor refinement.

Link to the demonstration video:
https://youtu.be/SclqbuaARos

Case 26



Conceptualization image of VTOL fixed wing UAV

Industry:
Aviation

Approximate size:
Small

Challenges identified:
Simulations and analysis, system modelling.

Challenge(s) addressed:
A simulation-based study of how wind gusts affect the performance and stability of VTOL UAV. The aim was to understand the UAV's response to turbulent conditions and identify potential control or design improvements. Demonstrate the vision based precise landing.

Method of technology transfer used in the case:
Simulation study for analysis of effect of wind gusts on the VTOL UAV.

Findings:
The study showed that the in-house VTOL UAV requires extensive simulation-based testing to ensure stable operation in adverse wind conditions. The results provided insight into how gust magnitude, direction, and duration influence flight performance. The simulation demonstrated a vision-based precise-landing approach, confirming that the UAV can identify and align with landing targets using onboard cameras, even under moderate disturbances. This capability strengthens the UAV's potential for autonomous missions and difficult operating environments.

Feedback from the enterprise:
Initial discussions with the company are ongoing. They have shown interest in both the wind-gust analysis and the demonstrated precise-landing method and are evaluating how these findings can support further development.

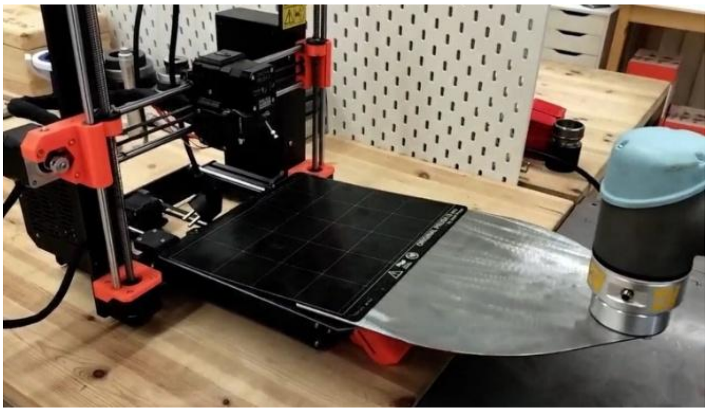
Outcome:
The simulation results and vision-based landing demonstration were presented to the company. Further collaboration opportunities—such as advanced modelling and extended testing—are now under discussion.

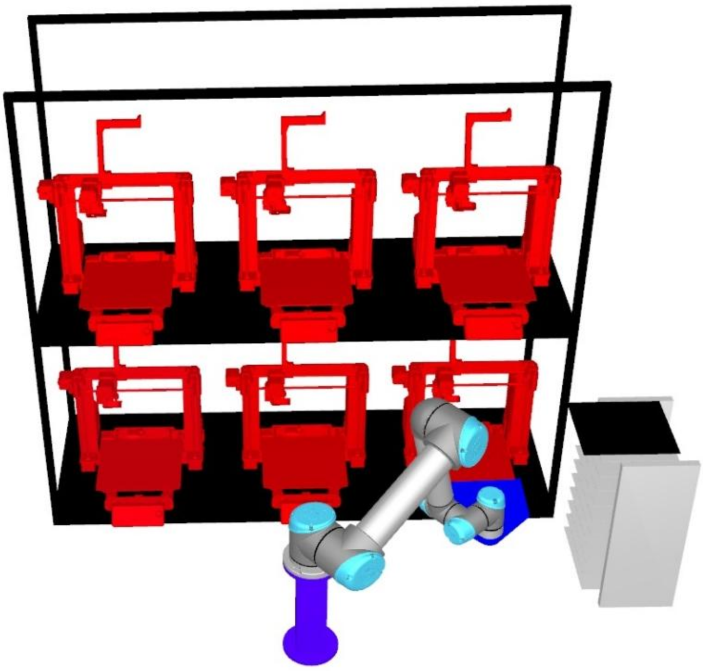
Link to the demonstration video:
https://youtu.be/0Gl8bEUN4oQ

Sweden

T2

Case 27





Industry:
Manufacturing (Diamond coated products, 3D printing products.)

Approximate size:
micro

Challenges identified:
Low machine utilization

Challenge(s) addressed:
Cobot solution to increase machine uptime, Simulation of machine tending

Method of technology transfer used in the case:
We have done a simulation and also hardware evaluation of a tool, presentation and physical demonstrations of the hardware.

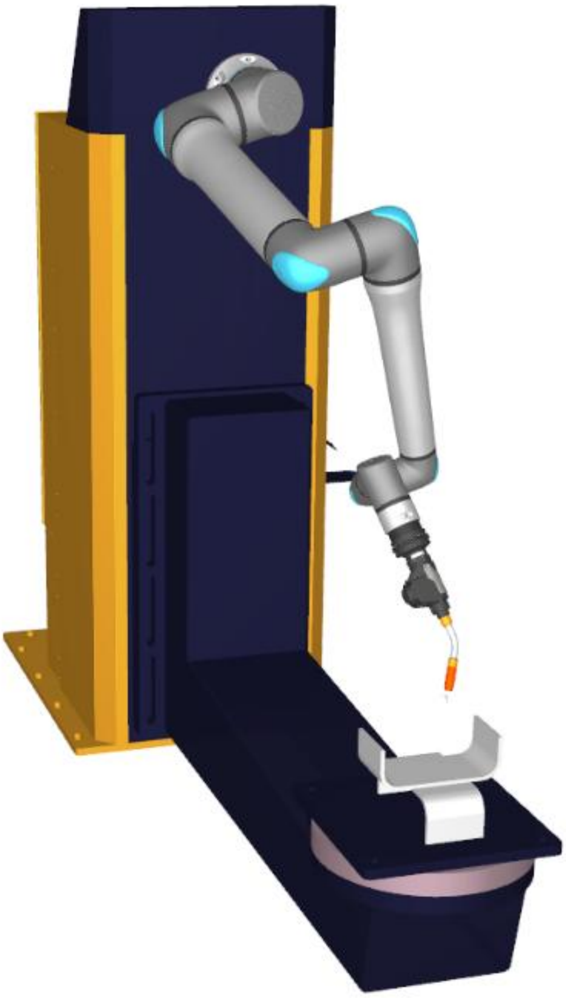
Findings:
The solution can be implemented using this type of automation. But the investment cost is high relative to the production volume; a large number of machines and high production volume could create conditions for the investment.

Feedback from the enterprise:
The company assesses that the initial investment cost is too high due to the number of machines in production and the lower market demand for the product.

Outcome:
No upcoming investments due to the case findings.

Link to the demonstration video:
https://youtu.be/bzGV9YrOO_I

Case 28a



***Industry**:*
Assembly industry.

***Approximate size**:*
micro

Challenges identified:
Integration of external robotics whit there existing positioner. That were a new concept to this company. The programmable logic had limitations both on hardware and software. The software was not futured proofed.

Challenge(s) addressed:
Show the possibilities with a general simulation of cobot welding together with a modern software suit.

Method of technology transfer used in the case:
Simulation, renderings, presentation to the enterprise

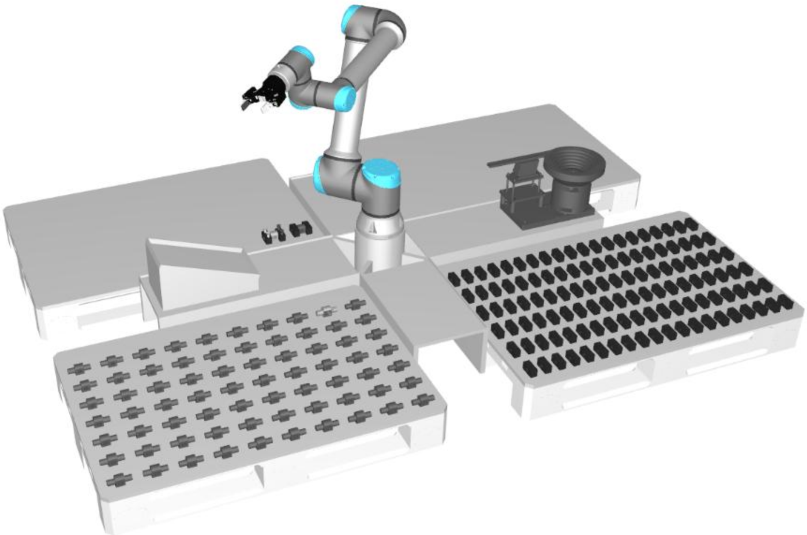
Findings:
Welding simulation done to showcase possible integration, this is only one of many possible integrations this concept can address. The upside to this case was that the case company was able to get a fast answer if the custom integration is feasible.

Feedback from the enterprise:
This case enabled them to see the possibilities of how their positioner can be used.

Outcome:
They did have a bigger need to address challenges in assembly, so it was converted into case 28b, subassembly.

Link to the demonstration video:
Images have been shown to the company, but there was not enough material for creating a demonstration video.

Case 28b



Industry:
Industrial assembly

Approximate size:
micro

Challenges identified:
A wide range of products and heavy parts, as well as static work.

Challenge(s) addressed:
A modular and flexible cobot station designed to assemble a wide variety of products with precision and efficiency. With adaptable architecture it will allow the company to easily reconfigure the station to meet changing production needs.

The station integrates collaborative robots that work safely alongside human operators, reducing the need for extensive safety barriers while increasing productivity and decreasing static labor. This flexibility not only shortens setup times but also lowers costs, making automation more accessible.

Method of technology transfer used in the case:
Simulations of collaborative robots and presentation of the simulations to the enterprise.

Findings:
Subassembly of static parts could reduce static movements from personnel.

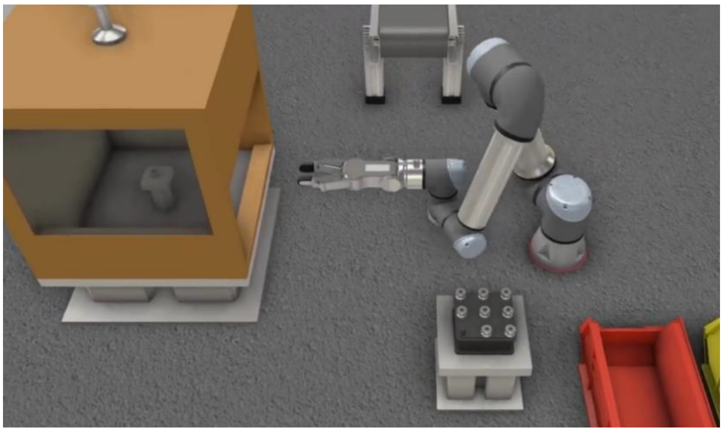
By implementing EU pallets with customized fixture solutions, the workstation becomes flexible and adaptable to a wide range of products, addressing the heavy parts handling challenges that were previously identified.

Feedback from the enterprise:
A good concept for our operations; the proposal will be applicable in the future.

Outcome:
Not suitable for investment at the moment, but the concept is appealing for future investments.
The enterprise is hoping to invest in the upcoming two years.

Link to the demonstration video:
https://youtu.be/Vk3SAtH_M9U

Case 29



***Industry**:*
Manufacturing (Diamond coated products, 3D printing products.)

***Approximate size**:*
micro

Challenges identified:
Difficulties in manually assessing the quality of diamond coated products

Challenge(s) addressed:
An automated solution employing advanced optical sensors to verify and ensure production quality across diverse manufacturing processes. By continuously monitoring products, the system detects deviations in surface integrity.

This approach minimizes human error and provides immediate feedback for corrective actions.

Its scalability makes it suitable for both small-scale batches and larger quantities, offering manufacturers a reliable path toward higher quality, reduced waste, and enhanced customer satisfaction.

Method of technology transfer used in the case:
Simulations and cross boarder collaboration with project partner Centria to enhance the simulation for the upcoming presentations to the SME.

Findings:
Material handling and robot cell adjustments can be implemented to improve efficiency and adaptability in production. However, there remains a significant degree of uncertainty regarding the maturity of sensor technologies and the robustness of algorithms required to manage and control surface variations.

While mechanical adjustments and workflow optimization can be achieved with relative ease, the challenge lies in ensuring that sensors can reliably detect subtle differences in texture, shape, and material properties. Current algorithms for interpreting this sensor data are not yet fully capable of compensating for these variations, which introduces risks of reduced accuracy and inconsistent quality.

Addressing these limitations will require further research and development in advanced sensing methods, machine learning models for pattern recognition, and adaptive control strategies. Once these technologies are refined, they will enable robot cells to handle automation solutions.

Feedback from the enterprise:
It is costly, and since the product is not yet fully developed, there are currently no funds to investigate the required optical sensor technology.

Outcome:
A solid foundation has been established for continued development, and the resources created will promote dialogue around future investments.

Link to the demonstration video:
https://youtu.be/kwKpFdRd6BE

Case 30

***Industry**:*
Education / General industry

***Approximate size**:*
small

Challenges identified:
Challenging to demonstrate to students and companies how automation can be applied and implemented.

Challenge(s) addressed:
Created a platform to more easily inspire and demonstrate the benefits of robotics and automation.

Method of technology transfer used in the case:
We have used simulations and physical showcases for companies and the public. Information about the cobot technology has been shared through meetings and discussions.

Findings:
Having a cell that is visual and easy to adapt helps to lower the threshold for simulations, and to inspire creative solutions and foster dialog. It gives just an overview of the step, whereas the simulation delivers more extensive details about the automation solution.

Feedback from the enterprise:
In this case we have had feedback from different schools, and they said that the students have increased interest in robotics and automation.

The companies concur that it is easier with the hands-on approach.

Outcome:
It is easier to inspire the local companies and the public with a physical cell rather than relying solely on digital simulation solutions.

Link to the demonstration video:
https://youtu.be/BoMOdjz63Ww