

## An integrated data management system for efficient planning, controlling and optimising flexible small series production processes

<b>Project title</b>	An integrated data management system for efficient planning, controlling and optimising flexible small series production processes		
<i>Project related to the previous concept</i>			
<b>PC No</b>	-	<b>PC title</b>	A step-by-step approach towards better information gathering and information management for predictive activities in order to improve planning and management process for flexible production plants in SMEs (Company 1)
	-		Improvement of business workflow (Company 2)
	-		PU foaming process automation (Company 3)

<b>Kind of project</b>	<b>Area of industrial modernisation covered by the project</b>
Investment project	Elasticity (flexibility) of production processes

<b>Project consortium</b>			
<b>Project leader (company name)</b>	[to be decided]	<b>Cluster</b>	
<b>Project partner</b>	COMPANY 1 (Polish SME)	<b>Cluster</b>	SAAM
<b>Project partner</b>	COMPANY 2 (Bulgarian SME)	<b>Cluster</b>	ACB
<b>Project partner</b>	COMPANY 3 (Serbian SME)	<b>Cluster</b>	ACS
<b>Project partner</b>	Several potential technology suppliers identified in Poland: software developers, integrators, and cybersecurity providers.	<b>Cluster</b>	SAAM

<b>Main issues covered in the project</b>	
Scope	<p>The project concerns the implementation of an integrated data management system in which data from machinery is gathered, MES and ERP are integrated and/or APS software is available, appropriate communication tools (panel, tablet, PC, phone) are at the disposal of the operators to deliver data to the system and to receive feedback from the system, with the aim to secure efficient planning, controlling and optimising flexible small series production processes. Tools such as CMMS, TCS, WMS... can also be part of this project.</p> <p>Key-words: data provided by machinery and by operators in real-time (number of good parts, number of rejected parts, quantity produced in the station during the day, data of various measurements), data visualised for the operators on a dashboard/panel/tablet/PC/phone (feedback), production planning, process optimisation, quality control, excluding excel spreadsheets for data gathering and management</p> <p><b>Requirements concerning the solution:</b></p> <p><u>COMPANY 1:</u></p> <ul style="list-style-type: none"> <li>- The solution will be applied in different areas of production (tool shop, serial machining, carbon composite production)</li> <li>- The system should take into account the current data base on the company's server</li> <li>- The system should communicate/interact with the existing ERP system</li> <li>- The system should allow to provide modifications according to new production activities provided in the company</li> <li>- System updates should be provided by the supplier regularly (compatibility issues, security issues)</li> <li>- The system should gather data from machine control systems (mostly Siemens), taking into account that for different machines different control systems can be applied (compatibility issue)</li> <li>- Communicate indicators on SCADA (visualisation of information based on gathered data, feedback)</li> <li>- Online access to information</li> <li>- Solution available in the native language</li> </ul>

Scope (cont.)	<p><u>COMPANY 2:</u></p> <ul style="list-style-type: none"> <li>- The solution should include improved compatibility between the machinery and MES (PLC, SCADA)</li> <li>- Thanks to improved data gathering, a wider spectrum of reports for management and control should become available</li> <li>- Integrated approach for production planning and production management</li> <li>- Solution available in the native language</li> </ul> <p><u>COMPANY 3:</u></p> <ul style="list-style-type: none"> <li>- Based on an onsite analysis it should be decided whether to implement MES or APS</li> <li>- Solution available in the native language.</li> </ul> <p>Company 1 already considered the following solutions: CoroPlus Machining Insights from SANDVIK, COMARCH MES, DANSOFT from Zutomtech. Drawbacks related to these solutions:</p> <ul style="list-style-type: none"> <li>- Data storage: stored in cloud on Amazon (CoroPlus)</li> <li>- Price: too expensive (CoroPlus)</li> <li>- Lack of certain functionalities so additional suppliers are needed (COMARCH MES)</li> <li>- System still under development (DANSOFT)</li> <li>- User-friendliness: too complicated (CoroPlus)</li> <li>- Connectedness: works only with milling machines (CoroPlus)</li> <li>- Gathering data: not easy to gather from machine control systems (COMARCH MES)</li> </ul>
Building blocks of the solution	<ol style="list-style-type: none"> <li>1. MES (with potential integration/data transfer with ERP; real-time machine and process optimisation)</li> <li>2. APS (production planning and scheduling of small series production activities)</li> <li>3. PLC, SCADA (compatibility, data gathering from machinery)</li> <li>4. Tool (tablet, panel) for data input by the operator and for data feedback from the system to the operator (visualisation)</li> <li>5. Description of the process of data gathering, data processing and information transfer</li> <li>6. Cybersecurity</li> </ol>
Financial aspects	<p>Cost of final solution depends on the kind of system chosen (only software or software +new hardware): 500 000 euro – 1 500 000 euro</p>
Staff and competencies	<ul style="list-style-type: none"> <li>- Staff to be trained in industry 4.0 issues to understand the process</li> <li>- Staff to be informed about the idea behind the project and consequences for the staff in terms of responsibilities, new competencies to be acquired</li> <li>- Staff to be trained in applying the final solution</li> </ul>
Risk analysis	<ul style="list-style-type: none"> <li>- Set-up risk <ul style="list-style-type: none"> <li>o There is no standard solution available to meet the needs of the companies, for each company a separate solution has to be defined – measure to mitigate the risk: an external expert could provide an audit in the three companies and define a common set of issues that could be covered together by the three companies and a set of issues to be managed by each company individually. Based on the outcomes of this analysis the companies should decide if it makes sense to continue the project together.</li> <li>o Solution providers are not experienced in working with SMEs with small series production – measure to mitigate the risk: SAAM identified two of its members as potential suppliers. One provides APS and the other one integrated MES-ERP. Both are used to cooperate with SMEs and large companies. One of them also has great experience with customers which work with small series or one-piece flow production. They could be considered in discussing the project and presenting their experiences during an online meeting with the three companies.</li> </ul> </li> <li>- Process risk and maintenance issues: <ul style="list-style-type: none"> <li>o The system demands for regular updates and interventions from the supplier’s side, who gives priority to his large clients, so smaller companies have to wait longer – measure: a SAAS solution could be considered, but one should verify aspects of cybersecurity. However, a higher security level in SAAS solution will greatly increase the total costs of ownership.</li> <li>o The operators are not willing to deliver data in the system and to use the data from the system, the visualisation tool is not used properly by the operators – measure: the selected tools (panel, tablet) should take in to account ergonomics and user-friendliness. The operators will be trained in using the tools.</li> </ul> </li> <li>- Financial risk <ul style="list-style-type: none"> <li>o The potential solutions meeting the companies’ requirements might exceed the budget – measure: The focus should be in the first place on the definition of the data flows, decision processes and expected impact. Based on this the companies should consider several options to assess potential solutions according to price, range of functionalities, areas of production management and process optimisation covered, impact. The requirements must be precisely defined, and a full spectrum analysis should be done for each of the companies.</li> <li>o Modifications and updates are costly – measure: the companies should clearly present their business activities related to diversified production processes for small series production. The suppliers should clearly state the limits of the potential solutions in terms of flexibility, modularity and compatibility. Another solution is for the companies to have an IT-app so that employees after training sessions will be able to fix modification and updates on their own.</li> </ul> </li> </ul>

Main activities covered in the project	
Pre-project analysis Defining the financial feasibility and the conditions in the company	<p>Steps:</p> <ol style="list-style-type: none"> <li>1. Description of the current process in the company (data gathering, data flows, data processing, visualisation)</li> <li>2. Description of the framework conditions, costs and risks related to the current process</li> <li>3. Analysis of the organisational and financial conditions that define the basic parameters for change</li> <li>4. Preparation of the financial feasibility report including recommendations concerning:               <ol style="list-style-type: none"> <li>a. Financial aspects</li> <li>b. Technical parameters concerning productivity, quality, flexibility</li> </ol> </li> <li>5. Including the key-information in the project proposal</li> </ol>
Pre-project agreement	<p>Steps:</p> <ol style="list-style-type: none"> <li>1. Defining the role and responsibilities of the actors in the project (automotive companies, technology suppliers, integrators, research institutions, branch experts)</li> <li>2. Defining the commercialisation possibilities for the solution to be later sold to other SMEs</li> <li>3. Defining the intellectual property rights issues for the project partners in the consortium</li> <li>4. Defining the tasks and the budget for each partner in the project</li> </ol>
Project activities	
1. Defining the technology challenges	<p>Solution requirements:</p> <ol style="list-style-type: none"> <li>1. Integration: MES, ERP (APS), system updates should not impact too much on the daily processes</li> <li>2. Compatibility: the solution should take into account different areas in production (also different PLC's, SCADA depending on suppliers of machinery)</li> <li>3. User-friendliness: local language, easy data input by the operator through a panel or tablet, feedback to operator, possibility to store data and retrieve it for future processes</li> </ol> <p>Preparation of technical requirements (specification) with the help of an external expert, including those aspects that could be considered commonly by the three companies and those aspects that should be dealt with separately.</p>
2. Finding suppliers	<p>Option 1 (suppliers not included in the preparatory process):</p> <ol style="list-style-type: none"> <li>1. Tender procedure based on the technical requirements</li> <li>2. Negotiations with potential suppliers</li> <li>3. Selection of supplier(s)</li> <li>4. Agreement between the three companies and the supplier to deliver the service</li> </ol> <p>Option 2 (suppliers included in the preparatory process):</p> <ol style="list-style-type: none"> <li>1. Suppliers included in the consortium</li> <li>2. Price of the service negotiated after the audit in the three companies</li> <li>3. Technical specification document prepared based on the price constraints and the organisational constraints</li> <li>4. Agreement between the three companies and the supplier to deliver the service according to the agreed price and technical requirements</li> </ol> <p>Option 3 (suppliers included in the preparatory process):</p> <ol style="list-style-type: none"> <li>1. Supplier(s) included in the consortium</li> <li>2. Supplier(s) covers part of the costs as his internal R&amp;D in view of commercialisation potential of new developed solutions, the implementation of the new solution in three companies will serve as a reference to promote the solution on a wider scale in the market</li> </ol>
3. Testing and implementing solution in Project Partners' companies	<ol style="list-style-type: none"> <li>1. Preparation of the solution (option: licence agreement for the use of existing software), adjusting the modules and functionalities to the local conditions in the three companies</li> <li>2. Option: purchasing additional hardware (PLC, SCADA) to improve data gathering and transfer</li> <li>3. Implementation of the solution in the three companies according to the technical requirements</li> <li>4. Testing of the solution</li> <li>5. Training of the employees</li> <li>6. Testing the solution by the companies' employees and launching the new data management systems</li> </ol>

Expected results of the project
<ul style="list-style-type: none"> <li>– An integrated data management system for efficient planning, controlling and optimising flexible small series production processes</li> <li>– Operators being able to provide data on a tool (panel, tablet) and to receive information from the machinery in real-time in order to provide the necessary adaptations to improve the production processes and product quality</li> <li>– Improved productivity and process efficiency</li> <li>– Improved product quality, less scrap</li> <li>– Diminished start-up time for new projects</li> </ul> <p>For this purpose, an estimation and expectation of ROI for this project should be prepared. Usually, 2 years is a good timeframe, and 1 fiscal year is also very good. It is calculated from go-live.</p>