Mo|Di|Pro

Modular Digitalisation for Profile Bending

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Department	Process Chains and Forming Units
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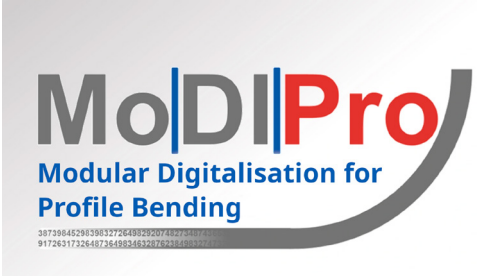
Abstract
The MoDiPro research project aimed to make profile bending processes more efficient, flexible and sustainable through modular and digital innovations. This was achieved by closely integrating state-of-the-art sensor technology, numerical simulations and machine learning technologies. The newly developed modules not only offer comprehensive options for process monitoring and optimisation, but also significant advantages in terms of scalability and sustainability. The solutions developed made it possible to retrofit existing machines and significantly increase the degree of digitalisation, even in older systems. The focus was on developing a modular bending machine with a flexible architecture that allows a wide range of adaptations and extensions. The results of MoDiPro impressively demonstrate how innovative technologies can improve both the efficiency and environmental compatibility of industrial processes.

Project description
MoDiPro focussed on the development and integration of innovative technologies in the field of profile bending. To this end, a holistic approach was pursued that encompassed several areas of development. The process sensor technology was expanded to include high-precision systems that record roll feed, material feed and profile detection in real time. These sensors were integrated into both new modular bending machines and existing legacy systems to ensure maximum flexibility and retrofittability.

In addition, the product sensor module enabled detailed detection of bending radii and profile contours. Both tactile and optical measuring systems were used, which are specially designed to monitor and document the quality of the bent profiles. This was a decisive step towards realising inline control of the bending process and ensuring product quality in the long term.
The development of a modular basic machine was another milestone. This machine is characterised by a high degree of mechanical and electrical modularity, which makes it possible to fulfil a wide range of requirements. The machine was designed in such a way that it can be used for complex industrial applications as well as for smaller, specialised processes. One focus was on the scalability of the components in order to be able to offer both cost-efficient and high-performance solutions.

Another highlight was the development and implementation of machine learning models. These models were trained on the basis of synthetic and real data in order to precisely predict and optimise bending processes. This not only reduced process fluctuations, but also significantly increased the efficiency and accuracy of the entire system.



[1] Project logo with stylised digital profile

Results
The results achieved as part of MoDiPro are versatile and have the potential to have a lasting impact on bending technology. The combination of process and product sensor technology led to a significant improvement in process monitoring and control. The integration of these systems into the new modular basic machine made it possible to make the production processes more flexible and adaptable. As a result, both existing and new applications can be implemented more efficiently and sustainably.

The machine learning models developed in the project achieved a prediction accuracy of up to 99%. This was achieved by combining real and synthetic process data and using advanced algorithms. The models made it possible to accurately simulate complex bending processes and carry out process optimisations in real time.

In addition, the modularity of the new bending machine has been utilised to adapt it for a wide range of applications. This includes the retrofitting of existing systems as well as the development of new, specialised machines. The results show that a significant reduction in process fluctuations and an increase in productivity was achieved through the use of simulations, sensor technology and machine learning.

Another important aspect was sustainability. Thanks to the modularity and the possibility of retrofitting, old machines can be used for longer, which contributes to a reduction in resource consumption and waste. This emphasises the importance of MoDiPro as a pioneering project for sustainable and efficient technologies in the field of bending technology.

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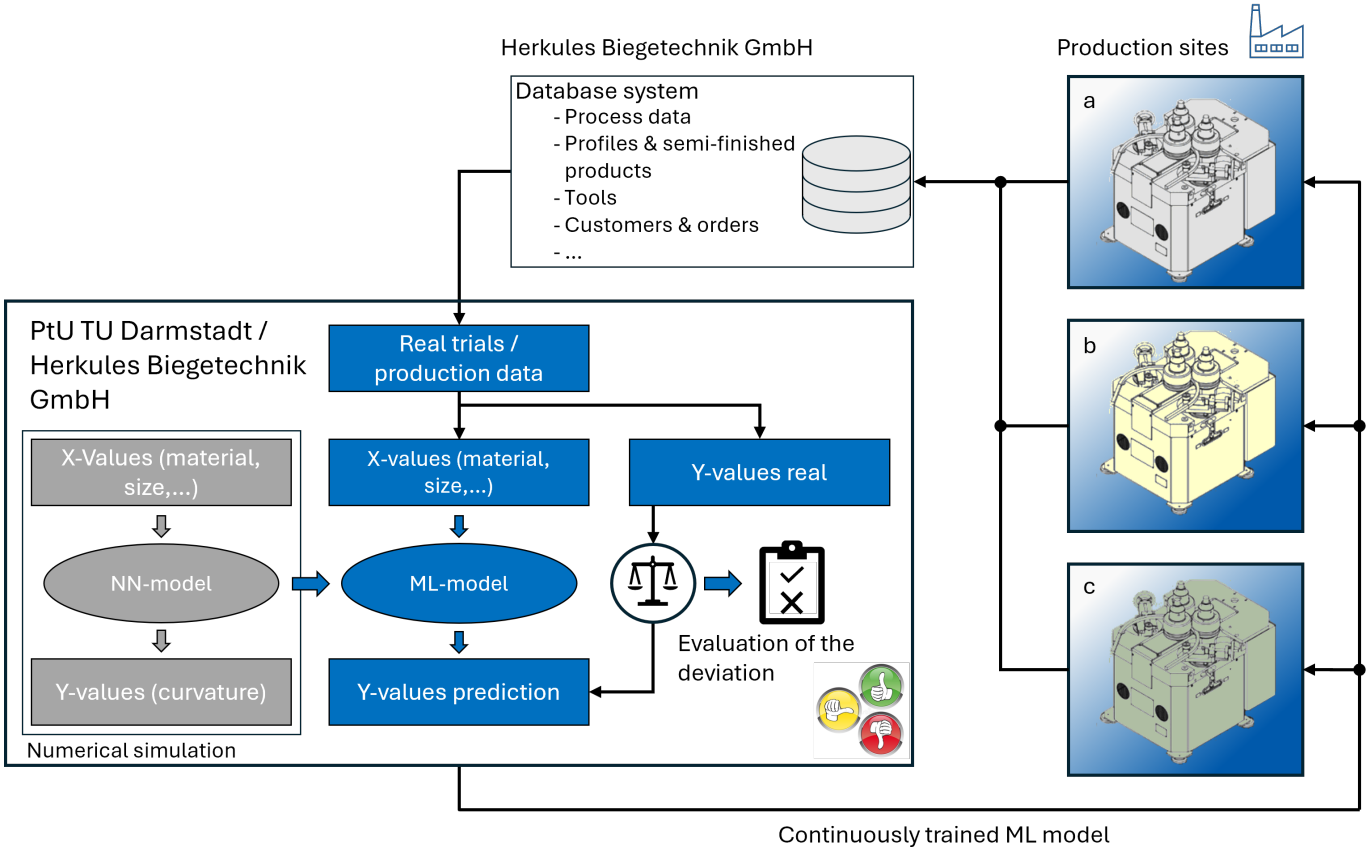

[2] Scheme of the centralised continuous model training

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Project Partners

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