

JSI - Vacuum pressure control at the plasma annealing and cleaning machine

This best practice presents the research and the development of the system for vacuum pressure control for plasma annealing and cleaning machines produced by an Austrian company. These machines are used in the process of production of wire and related metal products (metal strips, etc.). The machines simultaneously clean, anneal and cover wire surface in one single wire pass by using plasma. Vacuum pressure in plasma reactor is an important process parameter, which must be held within tolerances in order to guarantee stable plasma operation and wire quality. A control system is needed, which keeps pressure in tolerances by controlling the operation of vacuum pump and vacuum valve. The goal is to achieve low pressure deviation from the set point and fast response to the various kinds of process disturbances. In the project, software tools (programming blocks, configuration tools) and documentation are developed, which will significantly simplify the implementation of the predictive control to different kinds of closed loop control problems including vacuum pressure control of plasma machines. The project results are transferable, since the platform is designed to be applied to different kinds of technological processes.

<http://dsc.ijs.si/en/>

SWOT ANALYSIS

Strengths:

- The BP presents a platform enabling the application of predictive control technique for the optimization of engineering / industrial processes;
- Predictive control is more effective than other techniques for the optimization of processes;
- Developed platform presents software tools that help overcome the difficulties presented for the application of predictive control for the optimization of manufacturing processes;
- The range of applications of this platform is wide;
- The BP summarizes an 6th EU FW project;
- The developed tools were applied in the plasma machines of an Austrian company;
- The developer's team upgrades his experience and research level.

Weaknesses:

- It is not clear from the BP what would be the overhead for the application of the predictive control technique to other use cases even with the developed platform. This could provide an estimation of the relevant cost;
- The business that the BP addresses is also not detailed: the potential market is not estimated, the competition by other platforms is not given, the advantages of

this solution against current practice is not given so that a potential industrial end user can decide on the application of this method based on some quantitative data;

- There are any details for the results of the developed software;
- It is not clear if the developed software has advantages in comparison with existing ones.

Opportunities:

- The range of processes that this platform could be applicable is quite big;
- The developed platform can be useful for different other users;
- The developers of the platform could use it as base of future new areas of application.

Threats:

- The overhead for the application of this technique might be quite significant;
- Depending on the industrial / manufacturing sector the periods of economic turmoil makes industrial end users reluctant to invest and to try new ideas in their production processes;
- The modifications of the developed predictive control could be complex and difficult to realize.