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AUTOMATION TECHNOLOGY

PSI Technics Develops New and Innovative Methods for Optimizing Intralogistics Facilities

**Solutions from
PSI Technics always
put you one step ahead.**





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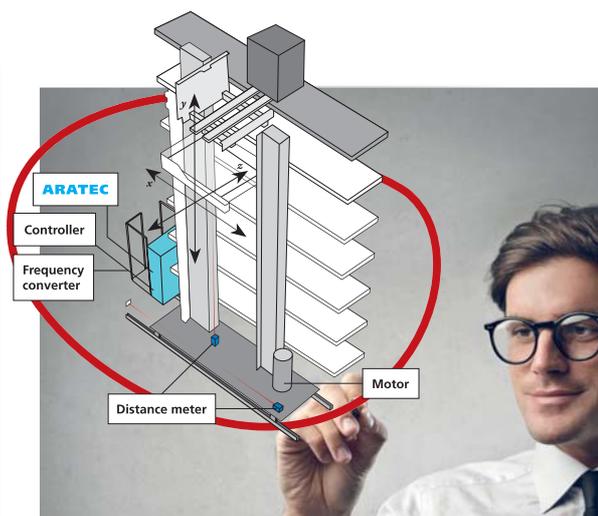
**We are Continuously Enhancing Our Solutions –
for Maximum Throughput with Utmost Reliability**



PSI Technics' motion analysis offering allows, for the first time, a comprehensive evaluation of logistics facilities. In recent years, PSI Technics has been able to reveal significant optimization potential in many of our customers' facilities, in particular with regard to oscillation control. Oscillations are most frequently caused by traditional positioning solutions that do not adequately account for the behavior of industrial vehicles. This leads to increased wear, premature failures and high cycle times, which leads to lower throughput and added costs.

PSI Technics offers a solution for these issues: ARATEC – the intelligent Positioning Solution System, an advanced closed-loop positioning control system specifically tailored for logistics facilities. The ARATEC enables the reliable and accurate positioning of industrial vehicles such as stacker cranes, bridge cranes, vertical lifting systems, and other rail-guided vehicles under the most demanding conditions.

This is just one of the reasons why many renowned customers from a wide variety of industries have been relying on solutions from PSI Technics for years. To meet the increasing demands of dynamic modern logistics systems, PSI Technics continues to enhance the closed-loop control models of the ARATEC.



Unlike the competition, PSI Technics optimizes your entire logistics system instead of merely focusing on particular components.

For example, in conventional positioning the drives are fine-tuned for the travel profile without taking into account continuous system wear, which in turn leads to cost-intensive repairs and downtimes.

By consistently developing its market-leading, intelligent positioning solution, PSI Technics offers clients the highest possible throughput while maximizing system reliability.

Our newest machine model optimization and the revolutionary development of the FLP6000AOC Advanced Oscillation Control underline PSI Technics' commitment to setting new standards for crane positioning within intralogistics.



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FLP6000AOC Advanced Oscillation Control and New Machine Model Identification Enable Improved Dynamics and Reduced Wear of Industrial Machines Used in Intralogistics

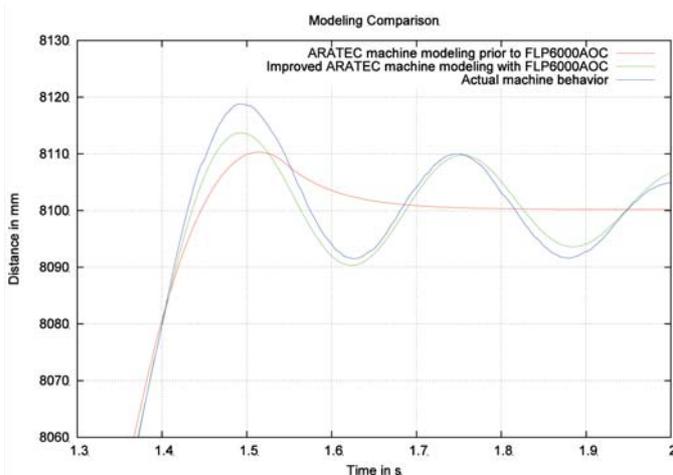
The ARATEC Positioning Solution System includes a self-learning algorithm that automatically adapts to the behavior of the controlled vehicle. PSI Technics developed the ARATEC Positioning Solution System to adapt to changing industrial requirements and to provide better control for highly dynamic systems while simultaneously reducing commissioning times in highly complex logistics facilities.

The ARATEC's automatic machine model identification capability is a core feature of the self-learning algorithm. It automatically calculates a machine model that best describes the vehicle's behavior based on the system's response.



Compared to conventional positioning systems it optimizes motion sequences, compensates for most oscillations and continuously reduces system wear.

The Figure below shows a comparison between ARATEC's previous and revised automatic machine model identification.



The example illustrates the behavior of a highly oscillating vertical axis of a stacker crane – a common disturbance that presents a challenge for all types of positioning systems.

The blue graph depicts the actual machine behavior. It represents the values measured during an automatic characterization performed by the ARATEC. The red graph represents ARATEC's previous machine modeling approach for calculating the machine behavior. The green graph represents ARATEC's new and improved machine modeling approach.

The deviation of the simulated models (red and green graphs) from the actual machine behavior (blue) is an important measure of the quality of the positioning system's machine model identification. The red graph represents the calculated machine model based on ARATEC's previously used machine modeling. Although the red graph provides a fairly good approximation of the stacker crane's behavior, the green graph representing the new automatic machine modeling approach matches the system behavior (including the actually occurring oscillations) noticeably better.



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Your Benefits: Considerably Reduced Oscillations, Shorter Cycle Times and Increased Throughput that Simultaneously Maximize the Lifespan of Your System

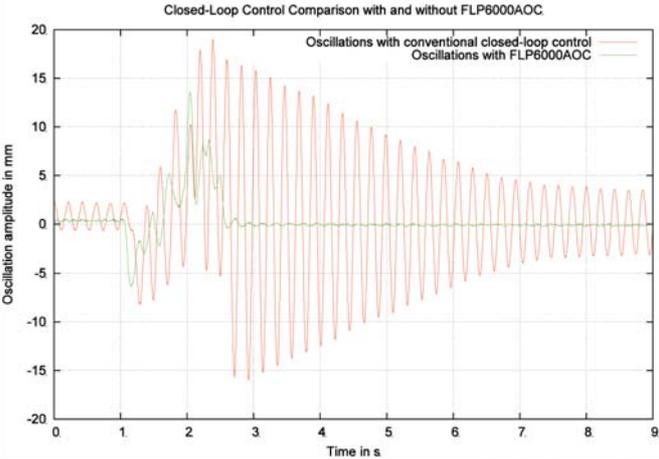
Based on this improved automatic machine model identification method PSI Technics developed an advanced closed-loop control solution – ARATEC with FLP6000AOC Advanced Oscillation Control – that offers optimum oscillation control for stacker crane masts.

Now oscillations that are caused by the stacker crane’s traveling movements can be prevented right from the outset while oscillations caused by

external influences are almost fully compensated for in near real-time. The ARATEC Positioning Solution System with FLP6000AOC positions highly dynamic vehicles in logistics systems better and faster than ever before.

The tangible result: Shorter cycle times, reduced oscillations and thus increased throughput that simultaneously maximizes the lifespan of your system.

The Figure below shows a Comparison of oscillations occurring between the base and the mast tip of a stacker crane using conventional positioning control (red) and with the new and improved ARATEC Positioning Control Solution with FLP6000AOC Advanced Oscillation Control (green).



The Figure shows a comparison of oscillations occurring between the stacker crane’s mast tip and the drive located at the base of the crane, a common setup for stacker cranes within automated storage

and retrieval system (ASRS) environments. For the conventionally controlled system a PLC and a laser distance meter were used at the mast base. For the ARATEC with FLP6000AOC control setup a laser distance meter at the mast tip was used for closed-loop control.

The red graph represents oscillations that are occurring when a conventional positioning controller is used that does not compensate for these oscillations – for example, a software module that can be added to a frequency converter drive.

The green graph shows measurably reduced oscillation with the ARATEC Positioning Solution System with FLP6000AOC installed on the same stacker crane. The oscillations that occurred before the actual positioning were caused by the acceleration and deceleration of the stacker crane.

The green graph clearly shows that the oscillations are almost non-existent after the vehicle has been positioned at the target using PSI Technics’ ARATEC with FLP6000AOC. No waiting times to compensate for oscillations are required prior to storage as is often the case for conventionally controlled machines. Apart from reducing cycling times, the ARATEC Positioning Solution System with FLP6000AOC also reduces mechanical stresses – a significant advantage with regard to system maintenance and longevity.

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