# Adivarent Control: The Real-Time Assistant
# Maximizing Systems and Operator Effectiveness and Capabilities

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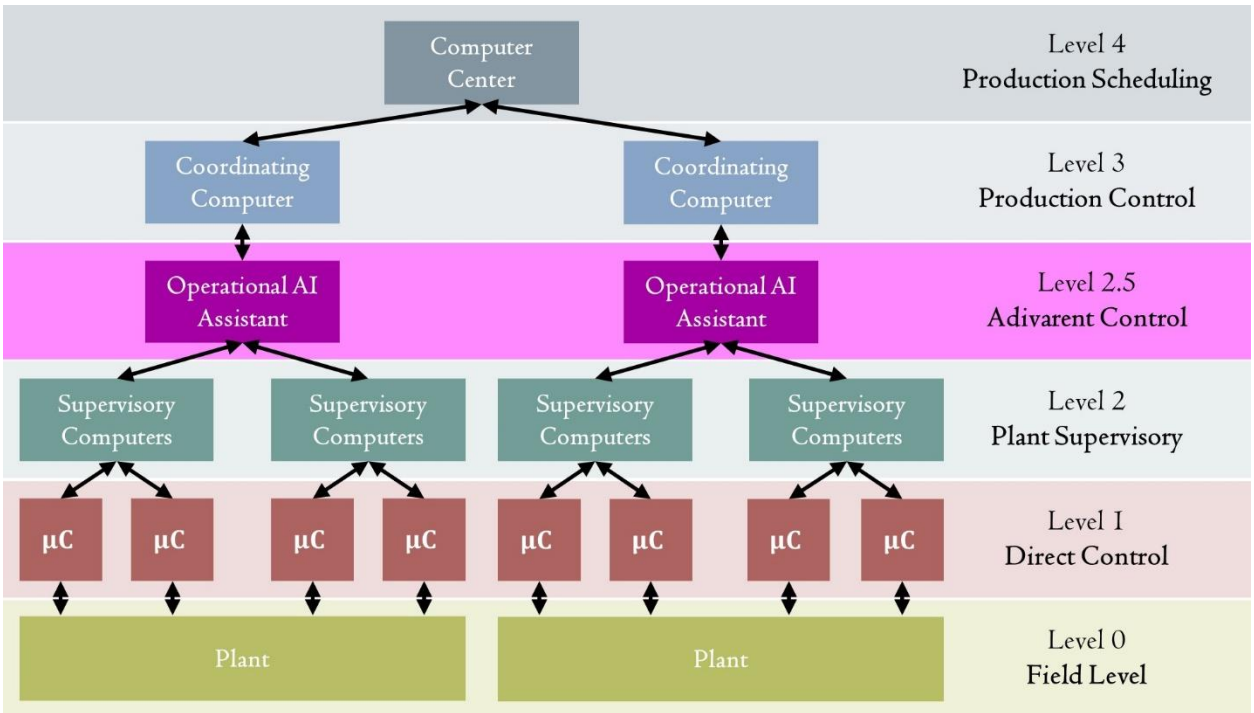
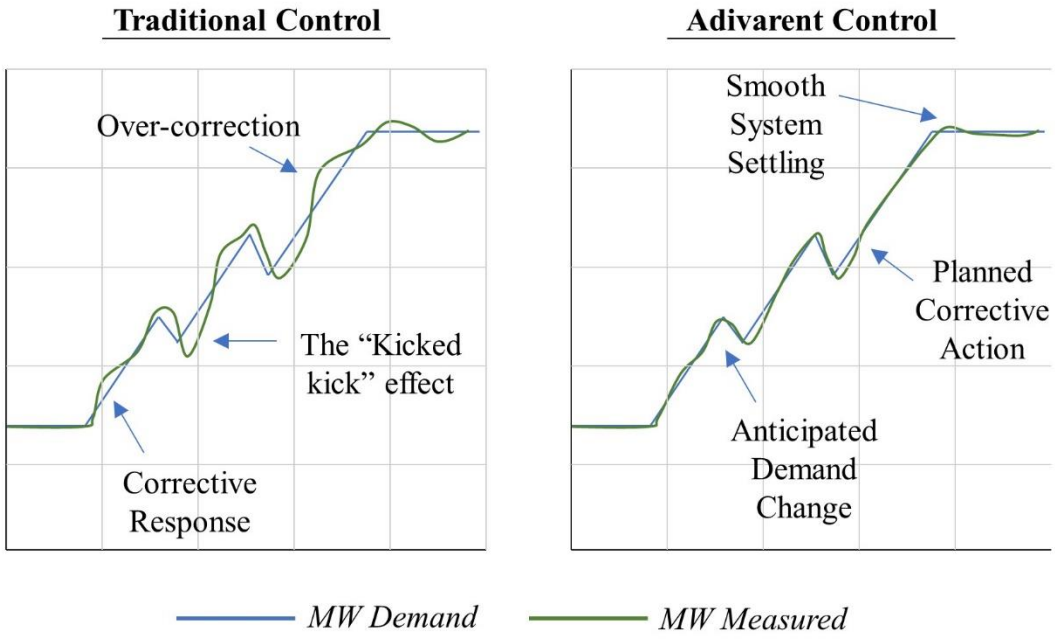
"Digitization", "Digital Transformation", and "Industry 4.0" are becoming commonplace terms in the industrial world. With digitization proving again and again across industry sectors that significant efficiency and monetary benefits are achievable with potentially no hardware investment, it's no wonder this is the case. In the interest of efficiency, many considering a "digital transformation" may ask themselves the question, "Why can't I do that with my current control system?" With all the buzz, many seem to have forgotten the potential of the systems they already have implemented, as well as the limitations of those very systems. The Purdue Model of ISA-95 has been widely accepted as the gold standard for the layout and architecture of process control and enterprise integration. Base control systems and Distributed Control Systems (DCS – the general term used herein to refer to all basic control systems) fits comfortably within this model, responsible for safety and system reliability. However, successful integration of new digital technologies designed to push system limits of production and efficiency don't necessarily fit within the traditional model. This is where Adivarent Control steps in, serving as the unique control layer dedicated to these tasks.




The term 'Adivarent' derives from the Latin word 'adiuvaret' meaning "to assist." For Taber International, this is the central role of this novel control layer: to act as the real-time assistant to control operators and control systems, filling the gaps in the capabilities of each to be the bridge between them, resulting in maximal output and efficiency of the combined entities. Rather than

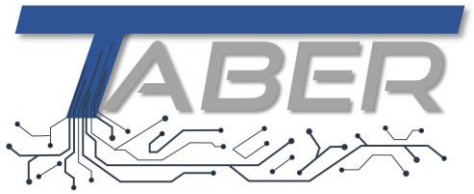
adapting and converting an effective DCS, the responsibility for maximizing system potential belongs to a dedicated platform. This special control layer is designed to be the real-time, intelligent, adaptive assistant to the control platform and to the operators using them, performing the heavy lifting of considering ever-changing system conditions and objectives, and identifying the immediate control movements to meet these objectives in a responsible, repeatable manner. Where the control operator is concerned with recognizing and mitigating those edge-case emergency situations, Adivarent control is constantly learning from and adapting to day-to-day operation and optimizing for ultimate efficiency and objective realization. Where the control system is concerned with maintaining robust, repeatable operation, Adivarent control is working on top of this baseline to intelligently adjust in real-time to further enhance stability and optimize performance. It successfully and repeatedly realizes the lean, expertly balanced system that is necessary to perform and excel in today's demanding operational environment.

Adding the Adivarent control layer considering the advancements of Industry 4.0 is the logical result of optimizing the control system structure itself. The common adage "jack of all trades, master of none" holds true when it comes to machines and control. Stretching the base control system beyond its original objective trying to catch and outperform in those many unique situations with a limited number of basic approaches will often only result in a system that is spread thin and ultimately less effective overall. Far too often we hear how DCS control engineers "added a kicker" to a PID loop because they needed to get in front of a sudden demand change, then they "kicked the kicker" because of how the system typically responds shortly after the first event. After so many kicks, how badly has that control system been beaten up and desensitized? Adivarent control is the solution – a separate, flexible, intelligent, adaptive system working on top of the robust and reliable DCS to identify in real-time the small adaptations and adjustments that will achieve lean operation and maximize performance. This leaves the existing control system or DCS to perform the functions it was intended for: safety and reliability.




The introduction of the Adivarent Control layer has been shown time and time again to successfully achieve sustained overall system improvements and objective realization across many processes while the system's base functionality remains intact and robust. The complexity of combustion optimization and air staging for emissions reductions and heat rate improvement is tamed with constantly learning and adapting artificial intelligence adjusting each individual parameter in small increments to improve combustion performance and energy transfer with less fuel. Conversely, necessary subprocesses that often have negative impacts on other process parameters can be broken down and engaged based upon the merits of each objective while considering the external implications, improving each simultaneously. This highlights another of those advantages that the Adivarent control approach provides: the recognition that not every objective is best met by the same method. Being able to apply the best control method for each individual problem, from very basic "if this-then that" logic to advanced AI, Reinforcement Learning, and Particle Swarm Optimization helps to ensure that many competing objectives can all be achieved. It's the innovative combination of multiple complementary approaches which each fit and interact within the process that result in successfully achieving multiple competing objectives.

Extending beyond the control methods, the process of implanting and developing Adivarent Control itself presents numerous advantages. As a flexible, adaptive system, its development is also designed to be flexible and adaptive. Deployed within the Griffin AI Toolkit® – a specially designed graphical, no-code environment – the system is intuitive and easily understood, enabling any authorized system and process expert to work within and improve the system with very little prior training. The opportunity for in-house experts to assist with system development means that each Adivarent




Control system is uniquely tailored to meet the needs and characteristics of each unique process. The end result is less time spent on repetitive tasks and emergency adjustments, and more time to look ahead at the bigger problems.

Digitalization and Industry 4.0 have provided a wealth of advancements in technology and capabilities, and it's now a matter of successfully integrating these for maximum benefit. Adivarent Control stands as that pathway, optimizing the integration process and making it possible for new and old systems alike to immediately take advantages of these advancements and become the lean, optimized systems in demand today.