Systems-Based Engineering Decision Example: Tesla's Gigafactory Production Planning

A perfect real-world example of systems-based engineering decision-making is Tesla's effort to automate its Gigafactory in Nevada. Tesla's initial approach to boosting production efficiency for the Model 3 was to use a great deal of sophisticated robotics to automate complex manufacturing tasks. This ultimately led to unforeseen difficulties, including having too many robotic units that required coordination, increased maintenance downtime, and a decrease in overall throughput. What Tesla quickly learned is that optimizing a single element (automation in this case) without considering the entire system will lead to significant inefficiencies in the long run (Keppeler et al., 2021).

Understanding this, Tesla's leadership, including Elon Musk, approached the production model from a systems-thinking perspective. Unlike many, he did not view automation as a stand-alone solution; instead, he considered the interaction automation had with other interrelated fields, such as quality control, operational speed, labor adaptability, and machine reliability. The result was a decision to reinsert human labor alongside machines, reintroducing stability to Tesla's operations. The blend of man and machine enabled the automation part to complete repetitive tasks. At the same time, humans can solve problems and adapt to change, demonstrating that they do not simply seek isolated areas of optimization but rather systems-level balance.

Reference

Keppeler, M., Tran, H. Y., & Braunwarth, W. (2021). The role of Pilot lines in bridging the gap between fundamental research and industrial production for Lithium-Ion battery cells relevant to sustainable electromobility: A review. *Energy Technology*, *9*(8), 2100132. https://onlinelibrary.wiley.com/doi/abs/10.1002/ente.202100132