



Digital Twin Technology for Clean Coal

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Coal powers many key industries such as steel production, power generation and cement manufacturing among others. Coal will continue to remain integral to these industries and hence, to the economic prosperity of many Asian countries for decades to come. Quality of the coal used dictates not only the environmental footprint of these plants but the operating costs and the revenue generation as well. While the emissions cannot be eliminated completely, they certainly need to be curbed without disregarding the economic factors.

Coal directly or indirectly influences emissions, performance and health of almost the entire plant and its various equipment. The inherent variations in coal properties and inability to measure these variations in real-time, thwarts even the state-of-the-art plants from achieving the minimum emissions and highest efficiency. Moreover, since procuring and blending decisions of coal are largely driven by economic factors, the onus rests on the operators to identify the ideal operation strategy. In such human centric decision making, the long term impacts of coal on various equipment go unnoticed, elevating the risk of unplanned shutdowns and hence increasing the overheads. Though designing better systems is an important step towards cleaner coal in future, more critical is addressing the need of existing plants, where the only levers to reduce the environmental impact are, an efficient operation strategy and smart coal usage. This is where the industry is increasingly turning to digital twin technology. Digital twin is a cyber-physical system that monitors, optimizes and controls the actual plant in real-time, through learning and diagnosis capabilities. At the heart of the digital twin is the predictive model that is built on a troika of data-driven techniques, physics based mathematical models and the artificial intelligence rules based on domain knowledge. Here, we present some of our digital twin stories in steel making, power generation and other industries, specifically addressing the problems pertinent to coal usage and impact.

