

DIGITAL TWINS IN PETROCHEMICALS

SIBUR uses digital replicas to streamline production and logistics.

Digital excellence

A valuable tool for increasing production efficiency, digitalisation is gradually taking over every industry. Digital twins, or virtual counterparts of real objects, groups of objects or processes, are the epitome of the digitalisation process.

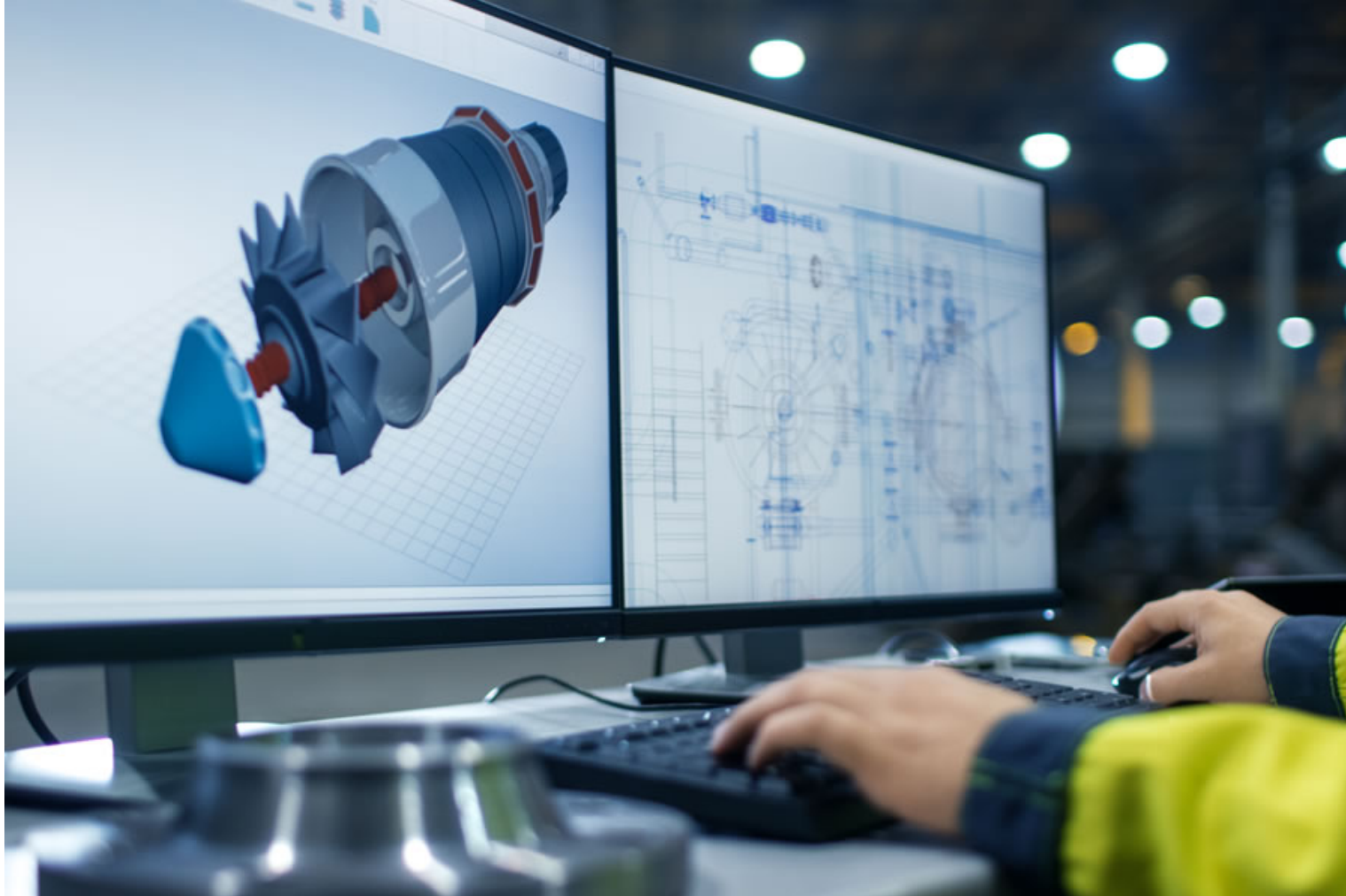
THE CONCEPT OF A DIGITAL TWIN AS A VIRTUAL EQUIVALENT TO A PHYSICAL PRODUCT IS TRACED BACK TO 2003 WHEN DR. MICHAEL GRIEVES PUBLISHED HIS DIGITAL TWIN: MANUFACTURING EXCELLENCE THROUGH VIRTUAL FACTORY REPLICATION.

Digital twin technology creates a mathematical model of a physical entity, machine, or process and uses it to analyse the dynamics of the original. The model is frequently updated to keep it aligned with the object's real operational parameters. This helps detect malfunctions, optimise equipment performance, prevent breakdowns and accidents.

Oil and gas and petrochemical industries are the main drivers of the digital replica market in Russia. "We develop every digital twin-related technology. Among these are engineering data management systems, process modelling, production and logistics simulators," says Vladimir Chernatkin, Head of Complex Digital Models at SIBUR.

The engineering data management system (EDMS) accumulates information on equipment and its interconnections, including its role in the production chain, standard process parameters, maintenance schedules, geometric and technical parameters, etc. Data in the EDMS is structured and linked to objects for easier access and possibility of automated data processing.

The system delivers significant time savings and reduces potential errors in maintenance, repair, and spare parts ordering. Service technicians use it to navigate the equipment and plan specific operations as part of scheduled repairs carried out every few years. In particular, the system can prompt the equipment parts that need to be shut down or blocked for a safe repair.



Digital twins are widely used to improve equipment performance.

NIOST, SIBUR's R&D centre, is one of the platforms for the development of modelling projects. The creation of a model or a process flowchart involves equipment modelling and recording of the data on chemical compounds and process parameters. Once the model is verified, optimal process parameters are determined and solutions are developed to improve technology and energy efficiency. The system's software can calculate such parameters as energy, heat exchange and even economic indicators like cost of additional equipment and upgrade feasibility.

SIBUR has also launched a project aimed at streamlining rail transportation, where digital twins help reduce repair costs, identify double-run operations in rolling stock management and streamline shipment management.

Development prospects

Nowadays, digital twins act as a true catalyst of modern companies' development.

DIGITALISATION IS CURRENTLY FOCUSED ON IMPROVING EFFICIENCY OF EXISTING BUSINESS PROCESSES.

A digital twin can be used by several companies simultaneously (for example, by a carmaker, service and insurance companies). Several digital twins can also be combined into one system.

The digital twin technology helped ADNOC, one of the leading oil and gas operators in the Middle East, "gather" its 20 upstream and downstream entities in a single Command Centre. The digital replica brought together all the company's assets across the Middle East and standardised the production processes.

According to analysts, digitalisation is currently focused on improving efficiency of existing business processes. On the one hand, further technology development will result in more detailed digital twins securing maximum return on investment in equipment and its maintenance. On the other hand, experts forecast that in the long run digital twins will not only contribute to the existing processes, but will also drive the development of new, disruptive technologies.



ADNOC used the technology to consolidate its 20 entities in the Middle East.

Legislative recognition is another step towards a stronger position of digital twins in the industry. As set out in the National Technology Initiative for the Removal of Administrative Barriers roadmap approved by the Russian Government, digital certification for products will be permitted from 2020.