Digital Project Delivery

Simplifying the complex

HATCH

What is Digital Project Delivery?

Digital Project Delivery (DPD) is the use of common and integrated data and delivery systems to manage an asset's information for its entire life cycle, from concept through to end of life management. DPD is expected to provide the opportunity for modest reductions in the project delivery costs of the study, planning, and design phases. More importantly, it is a critical enabler to achieve more substantial and meaningful improvements in construction productivity, site indirects, and asset management in operations, resulting in **substantial savings in CAPEX and OPEX over the asset's life cycle.**

Hatch uses a hybrid of vendor and in-house developed technologies to approve the most appropriate modeling and delivery tools that provide maximum benefits to projects which include:

- Reduced errors and re-work
- Reduced conflicts and changes during construction
- Allow better visual understanding of project concepts and scope
- Lower risk and construction cost and
- Reduced construction time

Digital evolution and mindset

Hatch has been at the forefront of data-centric design, with digital delivery constantly evolving to meet the industry's challenges, from data-centric engineering to BIM-enabled execution and today's vision of integrated project delivery and operations.

With recent advances in computing, cloud storage, and sophisticated data architecture, we can offer far more value in engineering, contracts and procurement, document and data management, construction, handover, commissioning and, very importantly, operations.

TRUSTED SOURCE

Information is from a trusted source

CONTINUOUS FLOW

Information continuously flows for the entire asset life cycle

COLLABORATIVE PRODUCTION

Information is produced collaboratively

RIGHT AMOUNT AT RIGHT TIME

Information is delivered in just the right amount at the right time

DATA-CENTRIC

Information is data-centric, not document-centric

SHARING AND TRANSPARENCY

Information is easily shared and exchanged, with transparent ownership

Hatch's digital mindset

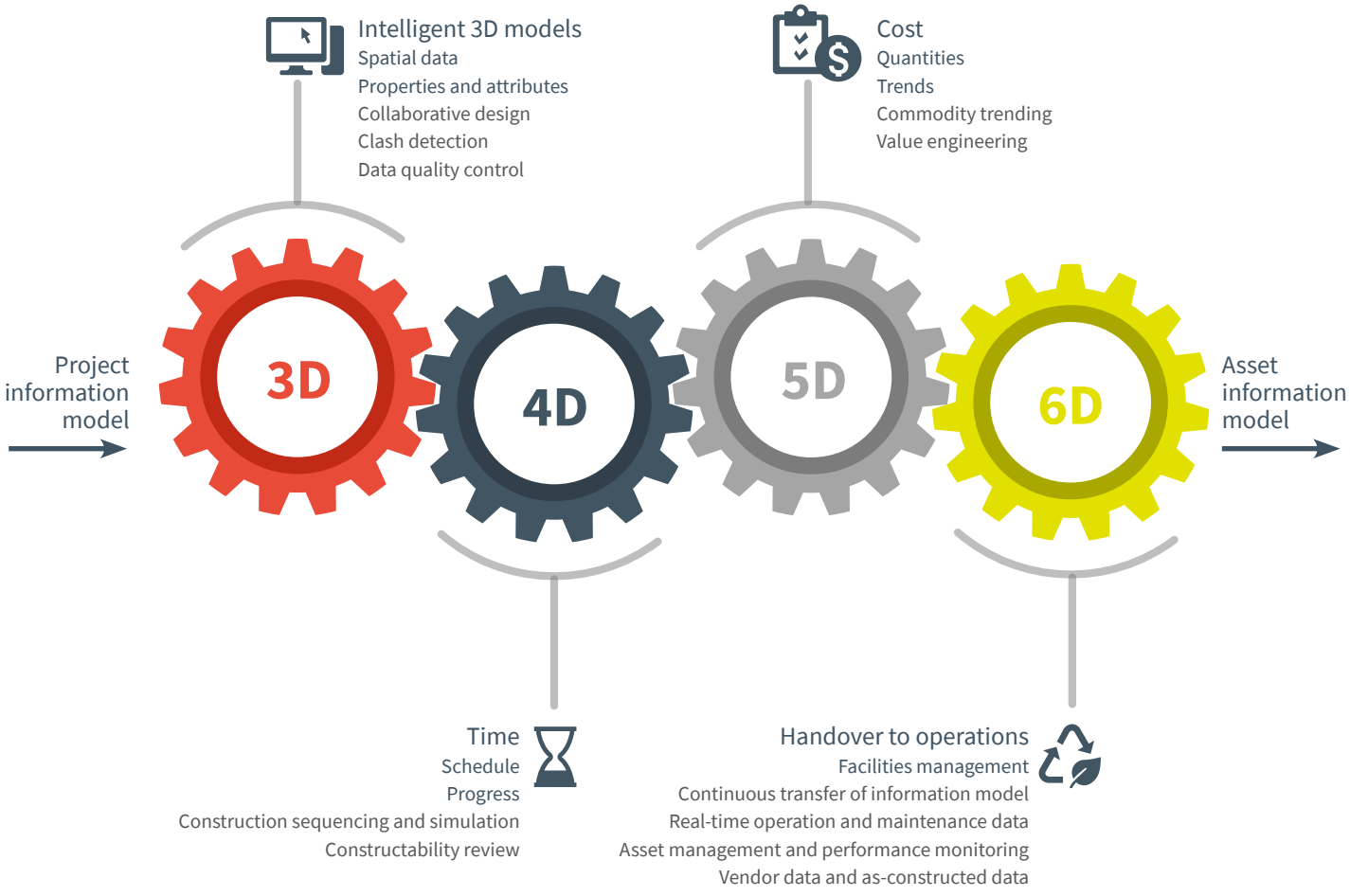
*The true integration of projects and operations requires a "**digital mindset**", which puts information management at the center of all our digital strategies and tools.*

Information Management is the central theme of our digital mindset. Well managed information assists in every aspect of an asset's delivery and operations, improving safety, decision making, quality and certainty of key outcomes including cost and schedule. When you combine a digital mindset with modern digital project delivery methodologies, you unlock a world of potential.

Digital Project Delivery

DPD involves a coordinated set of methodologies and processes supported by technology to create, manage, and share properties of an asset over its life cycle. For simplicity, it is broken down into a common “dimensional framework” which explains the major elements that make up DPD, including intelligent 3D models, the 4th dimension of time (including construction simulation), the 5th dimension of cost (including quantity and cost trending), and the all-important 6th dimension, where operations can fully make use of the information available.

When combined correctly these DPD dimensions enable the efficient delivery of **digital assets** that can enable significant value in operations.



Dimensions of Digital Project Delivery

3D

The basic principle is that graphical elements are modeled to pre-defined Levels of Development (LOD) and non-graphical elements to pre-defined Levels of Information that ensure the right level of graphical/spatial detail and non-graphical information is provided at the right time in the project.

3D models are developed with design authoring software where intelligent elements or components in the design environment are tagged with any relevant metadata and documentation e.g., O&M attributes, documents, drawings, specifications, manuals etc. that is valuable for future downstream use cases in procurement, construction, commissioning, handover and operations.

4D

4D is the link from the design component to the associated Construction Work Package (CWP) and construction sequencing. This allows for the simulation of construction, the ability to validate, visualize, and optimize the construction sequence in the model, as well as integration with project schedules.

4D enables the optimization of construction sequence and schedule, eliminating constraints and problems well in advance of construction, improving a project's safety, schedule, and CAPEX.

5D

5D makes the dynamic link from design components and quantities to the project cost control systems. Data from the design environment can be dynamically associated with line items and unit rates in the baseline cost estimate schedule. This allows for real-time quantification from the model as the design progresses and allows the design team to stay on top of design creep through quantity trending, optimizing CAPEX spend and minimizing or avoiding overruns.

6D and integrated operations

The fundamental principle is the seamless transfer of the data-laden design environment into the operations space. The digital assets created during design and construction are integrated with real-time operation and maintenance data during the commissioning phase, evolving into a digital twin. The digital twin applies robust models and analytical technologies to optimize an asset's performance during operations and eventually provides the basis for innovative designs in future projects.

Digital contracts and procurement

The goal of a digital procurement process is to track material from point of purchase to point of handover, exchange important data only, and eliminate PDF and paper transactions, which require multiple entries of information (usually manually).

The heart of the digital procurement system is that it allows third parties (vendors and contractors) to access a common data environment to deposit and retrieve information.

Digital construction

The goal of digital construction is to utilize the multi-discipline, data-centric environment, to improve construction methodologies with innovative processes, tools, and solutions to increase construction productivity and reduce indirect costs.

Improvement of productivity is possible by having plans, construction work packaging, materials, and tool information at the work face, digitally. Digital data distribution and collection for safety, material receiving/issue, construction progress/schedule, and turnover information is streamlined and reduces duplication of activities resulting in increased efficiencies as we move to a more paperless approach in execution.

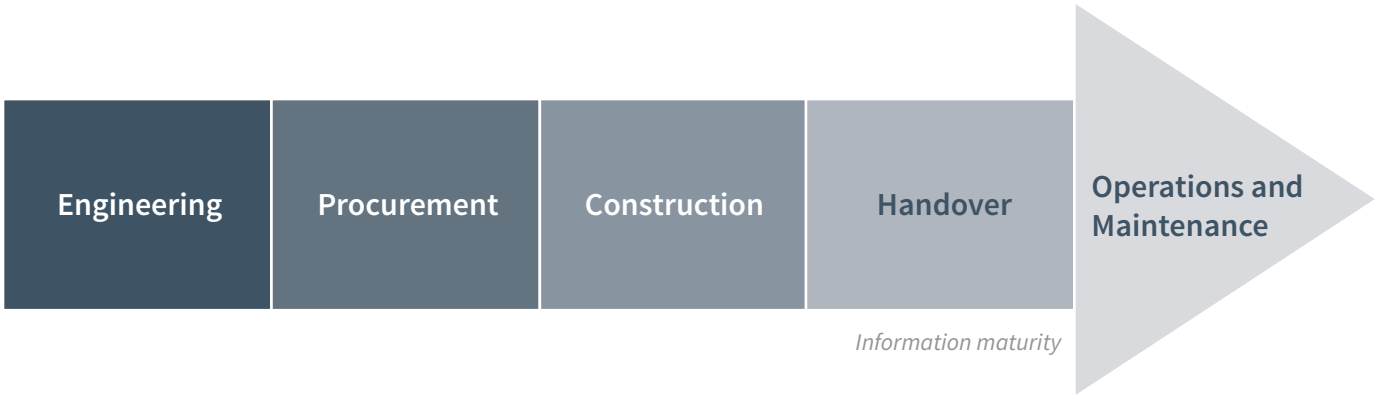
Digital commissioning

To manage the complexity of project completion, including documenting, tracking, and reporting, a large number of inspections, tests, deficiencies, and handover certificates requires a dedicated Completion Management System (CMS). Hatch's CMS is built around a cloud-based database that can be integrated with engineering databases, scheduling software and progress dashboards. It offers paperless execution of completions tasks and quality check for construction, pre-commissioning and commissioning as well as live progress reporting.

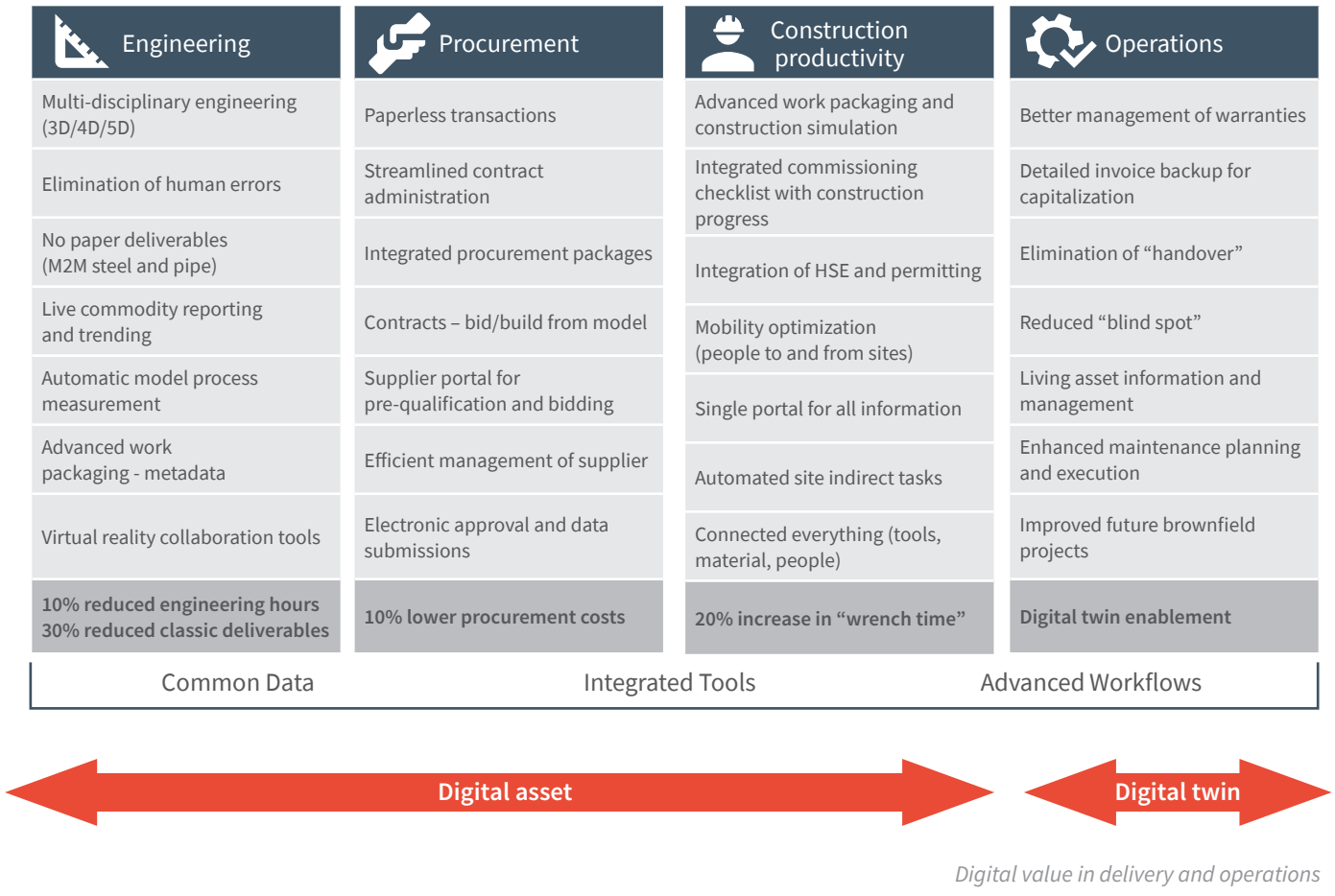
Digital commissioning also includes the ability to leverage advanced work packaging tools to digitally assign tags to commission work packages (subsystems) which then can be displayed in 2D drawings, 3D models and 4D simulations.

Digital assets and digital twins

Information management brings value across the entire life cycle of an asset: engineering, procurement, construction, commissioning, handover, and eventually, operations and maintenance. As the project progresses through engineering to handover, a complete **digital asset** is developed with the quality and maturity of the data continually improving.

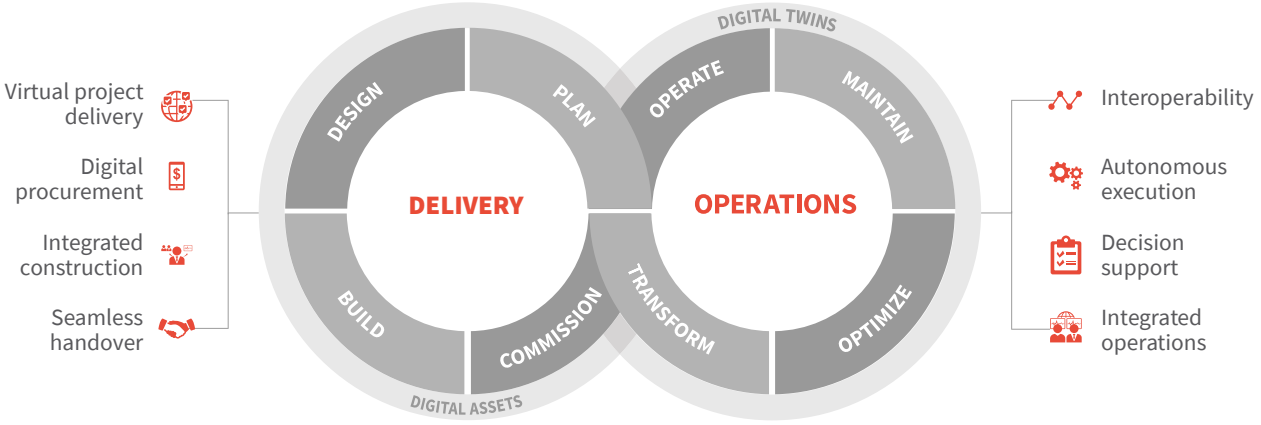


As the digital asset matures during delivery and into operations, it is progressively handed over until a complete digital representation of the asset is created. The digital asset can evolve into a digital twin, through connections to sensor networks and operational/asset management systems to drive further operational value and can be employed to generate simulation, analytical, and optimization capabilities providing easy access to trusted data and improved decision-making throughout the asset's life cycle.



Digital value in delivery and operations

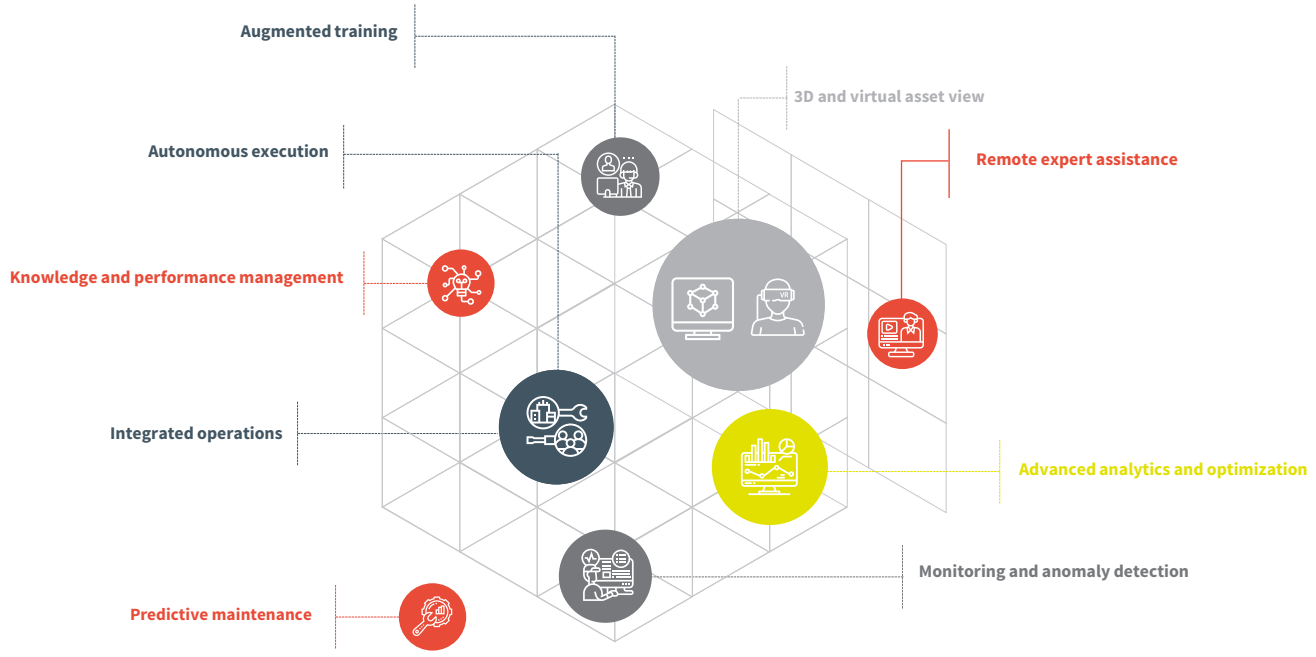
The continuous improvement process of an asset—optimizing, expansions, and sustaining capital projects—can be executed in a highly efficient manner, as the key data from previous delivery and operational stages flow from the digital twin back into the next stage of planning and delivery. We characterize this as an infinity loop with the data's genesis in engineering, improving through procurement, construction, commissioning, and operations and then flowing back again into planning and engineering to improve the asset and drive long-term value.



Virtuous infinity loop

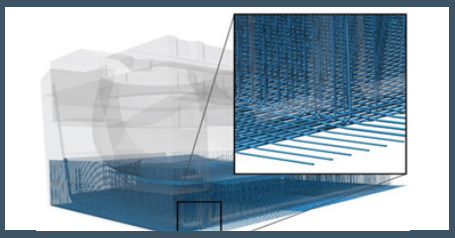
An asset's digital twin is a platform for a range of use cases that drive long-term value during an asset's operation. Hatch's Digital Practice is a dedicated group of digital operations specialists with the mandate to deliver maximum value from a project's investment in a digital twin.

Digitization of existing assets can be achieved by creating as-built models of existing infrastructure from 3D laser scans, point clouds, and photogrammetric images captured on-site. Hatch provides consultation and support services to help owner/operators maintain and re-use (or re-establish) engineered information throughout the plant life cycle.



Digital twin services

Examples of projects using DPD tools



Jansen Potash Mine Project

BHP
Saskatchewan, Canada | 2016 – ongoing

One of the most complex digitally enabled underground mines and processing facilities

Project description

- Greenfield underground potash mine and processing facility development and port infrastructure.

Added value

- A set of digital tools and processes leveraged during project execution and into operations, allowing project designs, schedules, quantities, and other deliverables to be simulated and managed virtually across disciplines.
- A collaboration platform that integrates with digital asset and engineering data to support e-procurement, invoicing, and payment.
- Document management solution providing single source for trusted and verified data available through multiple access points, and fully integrated to help reduce costs, increase efficiency, and improve handover.
- An integrated platform that centralizes construction information through a unified data approach in support of one true source, enabling consistent and reliable real-time reporting and analytics for better decision-making.
- Automated and repeatable construction onboarding processes through a platform connecting all steps in a seamless user experience, leading to work process efficiencies, and a reduction in onboarding time and administrative resources.

Benefit to client

- Forecast 15% reduction in construction costs due to improved productivity, reduced indirects, and reduced rework.

Keeyask Hydro Power Generating Station

Manitoba Hydro
Manitoba, Canada | 2012 – ongoing

Source of renewable energy to increase electrical supply within the Canadian province of Manitoba

Project description

- The Keeyask GS will be a source of renewable energy, producing an average of 4,400 gigawatt-hours (GWh) of electricity each year. Keeyask will be Manitoba's fourth-largest generating station, and the fifth generating station in the Split Lake Resource Management Area. Construction began in 2014 with first power in 2019, and project completion expected for 2021.

Added value

- Modeling of 3D rebar, clash detection, and resolution management of embedments was improved as well as automatic generation of bar schedules issued to the fabricator allowing them to import directly from design systems into their rebar bending machines, saving time and data entry errors.
- Integrated BIM processes ensured accurate 3D modeling, automated and accelerated project deliverables, and optimized collaboration and information mobility, reducing project costs and delivery time, and enabling quicker resolution of fabrication and construction issue.

Benefits to client

- Modeling rebar is superior to traditional methods because it allows the project team to visualize the design in 3D alongside other embedded materials typically required by other disciplines, including piping, electrical conduits, or various other steel members. Saved the cost and time of producing 2D shop drawings.
- Determined discrete concrete pours, rebar placement, and the precise location of earthworks, to dramatically increase the accuracy of the project model.

Cross River Rail

Cross River Rail Delivery Authority
Brisbane, Australia | 2019 – ongoing

Helping the Queensland government implement digital enablement for Queensland infrastructure

Project description

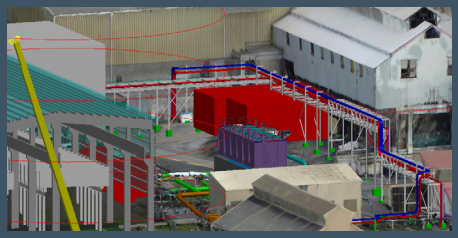
- Cross River Rail is a new 10 km rail line in Brisbane which includes 6 km of twin tunnels under the Brisbane River.
- Hatch is the primary design consultant to the design and construct sub-contractor.

Added value

- Hatch DPD systems providing integration between project systems and authoring tools, allowing automated workflows and standardized processes.
- Project delivery (to ISO19650) uses a Common Data Environment (CDE) to manage the exchange of files and supports design coordination through federated design models.
- The CDE includes the WIP, shared (collaboration), and preserves the published versions (IFC, etc) allowing checking/review in line with ISO 19650.
- 3D design models delivered in IFC format to LOD 300/350 with associated metadata supporting client BIM use cases through design, construction planning, and into operation.
- The CDE ingests content from multiple models produced in different file types.

Benefits to client

- Ability to exchange with other contractors.
- Improved coordination through design and construction issue/clash checking within the 3D model (before issue) allowing solutions to be visualized by project participants, amongst multiple project contractors, assigned to responsible parties, and tracked to closure.
- Automated processes to manage shared information saves significant manhours compared with manual processing.
- Standardized automated workflows for drawing review allowed for consistent capture and rapid close-out of comments.



Jadar

Rio Tinto
Loznica, Serbia | 2013- ongoing

Developing one of the world's largest new sources of lithium using digital assets for a digital twin

Project description

- Jadar is a unique, world-class lithium-borate deposit in Serbia.

Added value

- The Hatch Common Data Environment (CDE) is built on industry-leading cloud services providing global access to all project information including documents, data, and design content.
- Siemens COMOS is being used to deliver an integrated multi-discipline engineering data set, covering P&IDs, electrical, and instrumentation engineering solutions.
- Establishing digital delivery during front-end loading phases allows smooth transition into execution and subsequently the full asset life cycle.
- The CDE platform enables the project digital asset that is the genesis of the operational digital twin.
- The CDE enables integration of design authoring platforms providing an agnostic solution for multiple service providers to utilize their own design tools and processes.

Benefits to client

- Improved efficiency in engineering delivery.
- Significant reduction in handover hours and asset integration efforts.
- An enabled virtual environment that can be used to operate and maintain the plant more effectively and safely.
- An enabled digital twin capability provides opportunity to improve plant uptime and lower operating costs during the operation and maintenance phase.

EGA Power and Stream Project

Emirates Global Aluminium (EGA)
United Arab Emirates | 2013 - 2019

Expanding an existing power station

Project description

- Expanding a major power station to deliver additional power and steam to a neighboring alumina refinery.

Added value

- Training while immersed in the digital environment allows personnel to experience and understand work tasks to a higher degree of clarity and boosts effectiveness of training exercises.
- Immersive learning systems are applied as part of the overall training plan to augment other learning methods where appropriate.
- Interactive scenarios, based on avatars or first-person immersion, of commissioning, maintenance, and operational procedures better prepare workers for the expected physical work environment.

Benefits to client

- 10% reduction in time needed to prepare workers to be safe and effective in their jobs.
- Enhanced safety as employees is familiarized with their future working environment and procedures before they enter actual work environments.
- An enabled virtual environment that can be used to operate and maintain the plant more effectively and safely.
- Improved ability to simulate and prepare for critical situations.
- Reduced mean time to repair and mean time between failure value.

Confidential Project

2020 – ongoing

Enabling brownfield design with photogrammetry

Project description

- New Zine Cellhouse project to be installed within an existing facility with challenging lay-out constraints.

Added value

- Accelerate image and point-cloud data performance to provide precise digital context for design.
- Accelerated communication and understanding of plant layout and design, construction, and operations.
- Enhance constructability process during engineering design phase.
- Enabling more effective reviews and identification of issues.
- Avoid effort maintaining deliverables not used for plant operations.

Benefits to client

- Minimized safety risk by fewer people being on site and reduced exposure time to plant environment
- Avoid effort maintaining deliverables not used for plant operations.
- Quickly scale project design with less investment and time.
- Reduced effort of modeling of existing assets to understand existing layouts.
- Reduced time to current as-built information available to project and field resources.

HATCH