

FASTER TIME-TO-MARKET FOR CAPITAL PROJECTS



K'NOWBE'S BUSINESS

1. EPC: Turnkey EPC with emphasis on automation of workflow to accelerate time-to-market
2. Fabrication: modular fabrication shop (Salt Lake City)
3. Software: 3D design and 3D scanning software platform built on database of >5 million SmartParts

PROJECT EXECUTION GOALS

Performance Targets	Reduce time to market by 50%
	Reduce engineering cost to between 2.5% to 5%
How	Automate workflow – transform from file centric to database centric software platform
	Create 3DSmart design platform: Smart P&ID, 3DSmartModel
	Create massive database of >5 million SmartParts
	Focus on modularization to reduce field-fit costs

ONE PROBLEM IN PROJECT EXECUTION

1. Owners are frustrated with EPC workflow efficiency, schedule slippage and busted budgets
2. EPC's tell owners they must spend more time and \$ up-front planning
3. Bandaid solutions: increase staffing (industry consolidation), outsourcing (Asia, India, Latin America) and increasing checks & balances
4. Solution offered by software sector supporting EPC: support existing workflow with more features and functionality

THE ENGINEERING MARKET IN ALBERTA

1. Engineering represents 8% to 18% of capital budget
2. Capital spending in oil & gas: 2013 forecast = \$63 billion (2012=\$55b) with \$23 billion in oilsands (2012=\$20b)
3. Capital spending by GoA on infrastructure = \$5 billion in 2013
4. \$191 billion of large projects (>\$5 million) under development
5. Engineering fees \$5 to \$6.3 billion for Alberta oil & gas projects per year - 60,000 engineers in Alberta

PROBLEM IN TRADITIONAL EPC WORKFLOW: WHEN DOES THE CUSTOMER SEE A 3D MODEL?

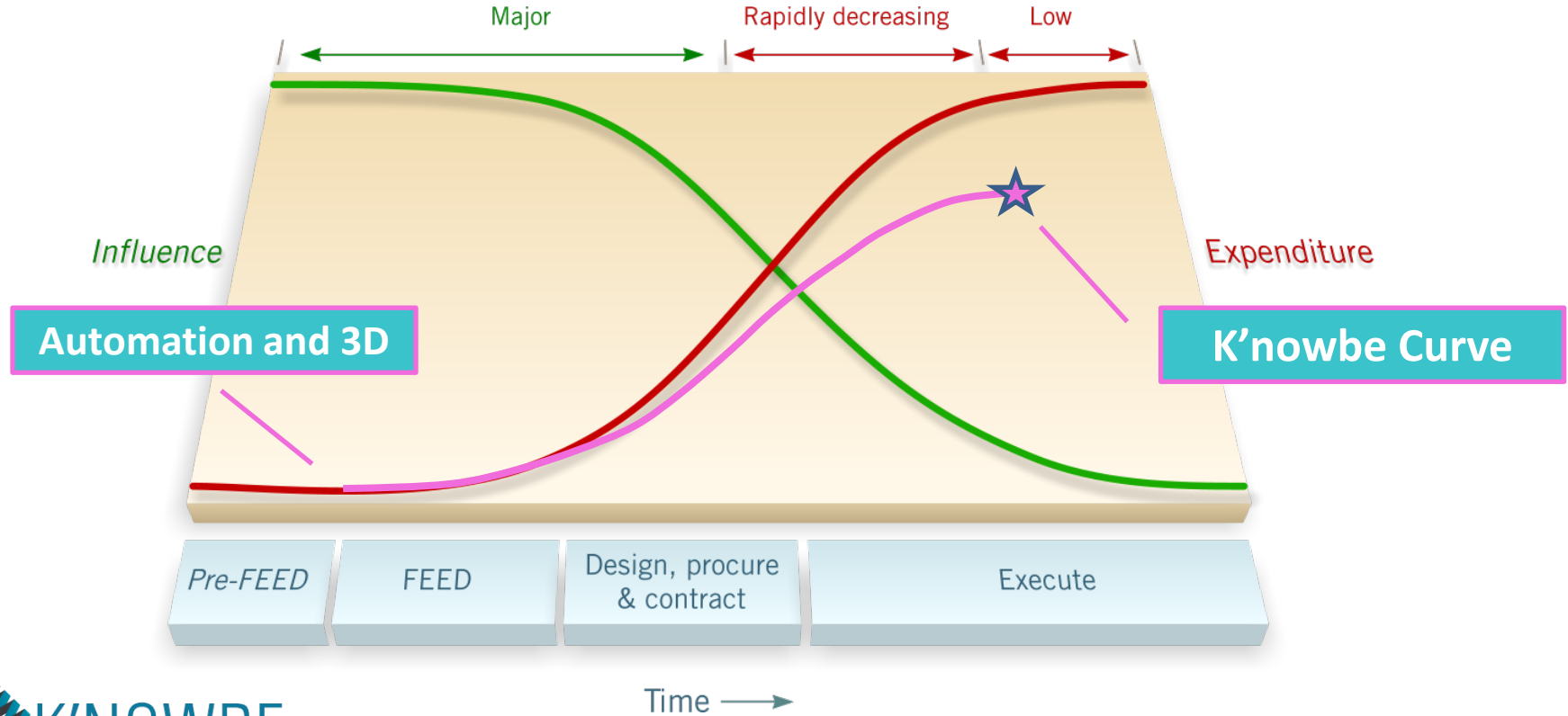
AFE Stage	Not available
IFR	Not available
IFA (FEED)	Not available
IFH (Hazop)	Not available
IFD	10% model review
IFC	30% model review
Re-IFC (Turnover)	90% model
As-Builts	90% model

Automation
Yields 60-
90% Model

THE ENGINEERING SOFTWARE MARKET

1. Engineering software providers behave rationally in the marketplace - they provide product that supports their customer's business model
2. Autodesk estimates 10 million AutoCAD users worldwide
3. General status of software:
 1. Legacy systems built on chassis of smaller RAM and slower processors
 2. Lack of 3D content to “drive” development of 3D platforms
 3. Designs executed with “file-centric” workflow

Cost and Schedule are Improved by Applying Knowledge and Tools Earlier



SAGD EXECUTION: IMPROVED USING AUTOMATED WORKFLOW

Rank	Lesson Learned	Score
3	Define vendor data requirements early	8.5
5	Timely receipt of vendor data	8.4
6	Effective change management process	8.4
7	Fully-developed P&IDs at IFC	8.4
8	Identify and order long-lead items early	8.4
9	Communicate design changes and decisions	8.4
12	Fix basic process design early	8.4
13	Early involvement of construction/operations in design	8.3
20	Build regulatory requirements into design to meet approval	8.2
22	Engineer for operability, maintainability, constructability	8.0
		survey by Halari & Jergeas (2011)

GAME-CHANGER: AUTOMATION AND 3D

1. Possible to produce better designs, faster
2. Requires new workflow
3. Requires investment in automation plus 3D

COMPARISON TRADITIONAL EPC VS K'NOWBE



GAME CHANGING STRATEGY

1. Cloud-based infrastructure and automation of workflow
2. Create “asset-centric database” that supports entire life-cycle of project from “concept to can”
3. Utilize 3D scanning and 3D design tools that utilize powerful graphics and RAM
4. Create massive library of “SmartParts” – build content that is accessed by powerful tools
5. Write custom software applications and plugins that sit atop traditional software

3D SCANNING PRIMER



1. Based on principles of laser survey theodolite
2. Rotating prism captures millions of datapoints in vertical slice
3. Rotating transmitter captures thousands of vertical slices in 360 degree circle
4. Generates tens of millions of x-y-z data points - “point cloud” containing ½ terabyte of data
5. Create 3D Geometric Model

K'NOWBE GAMECHANGER WORKFLOW AND SOFTWARE



1. Convert the “dumb” geometric model to a 3DSmartModel
2. Link the 3DSmartModel to Process & Instrumentation Diagrams (SmartP&ID's)
3. Link 3DSmartModel and the SmartP&ID to database of >5 million SmartParts
4. Database now supports design, procurement, construction, operations, maintenance

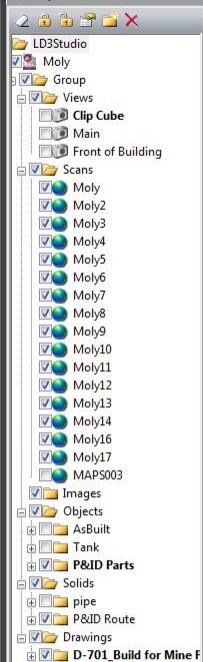
CASE STUDY #1 – EXPAND WATER TREATMENT SYSTEM



World

none

LD3 Project



Properties



Property Value

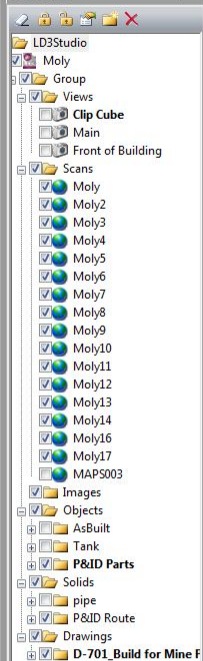
Output



Deleting selected objects



LD3 Project



Properties

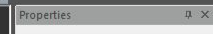


Property Value

Output



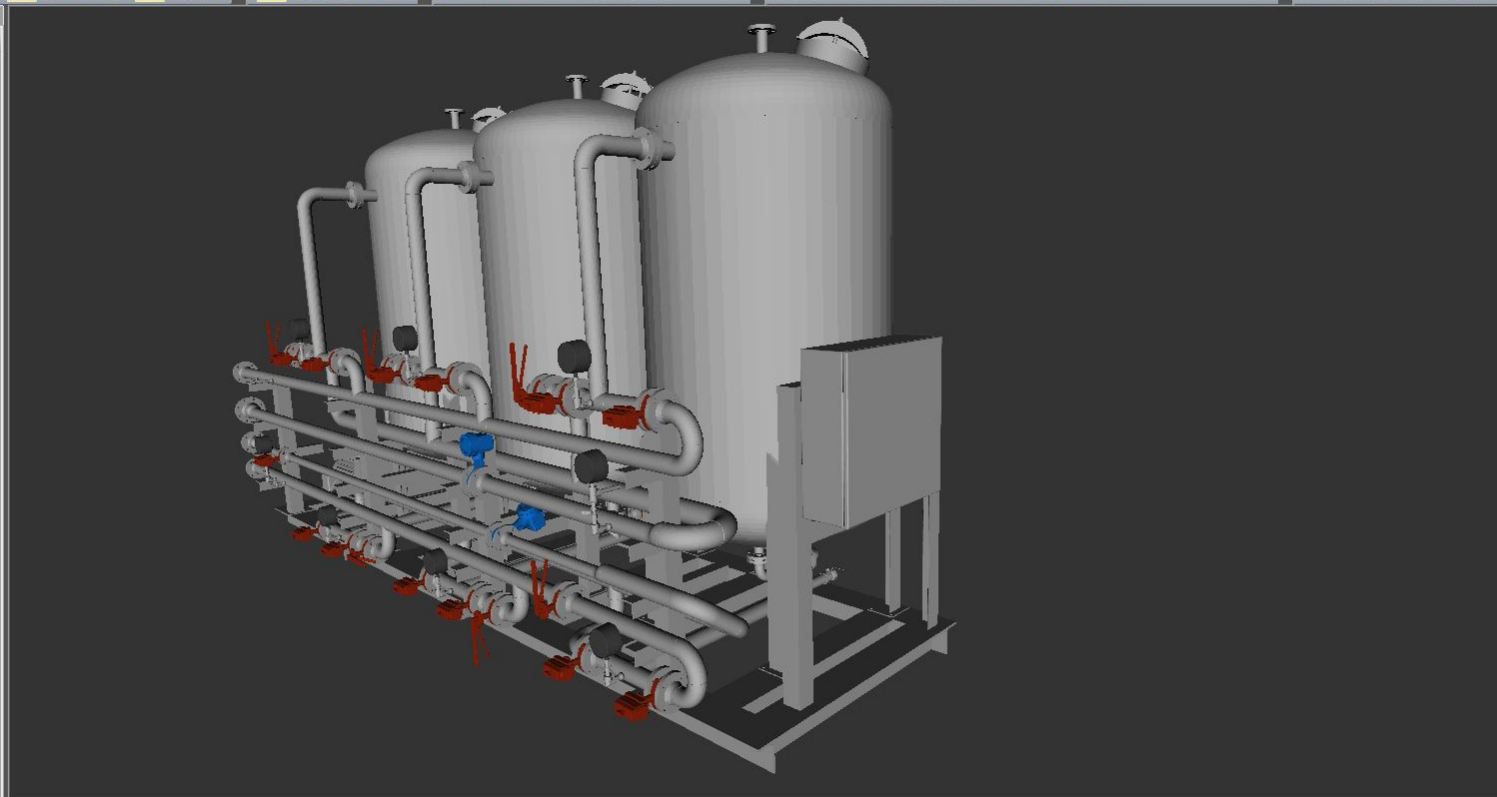
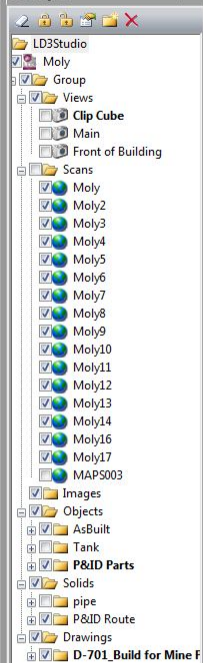
Deleting selected objects



17 X



LD3 Project



Properties



Property Value

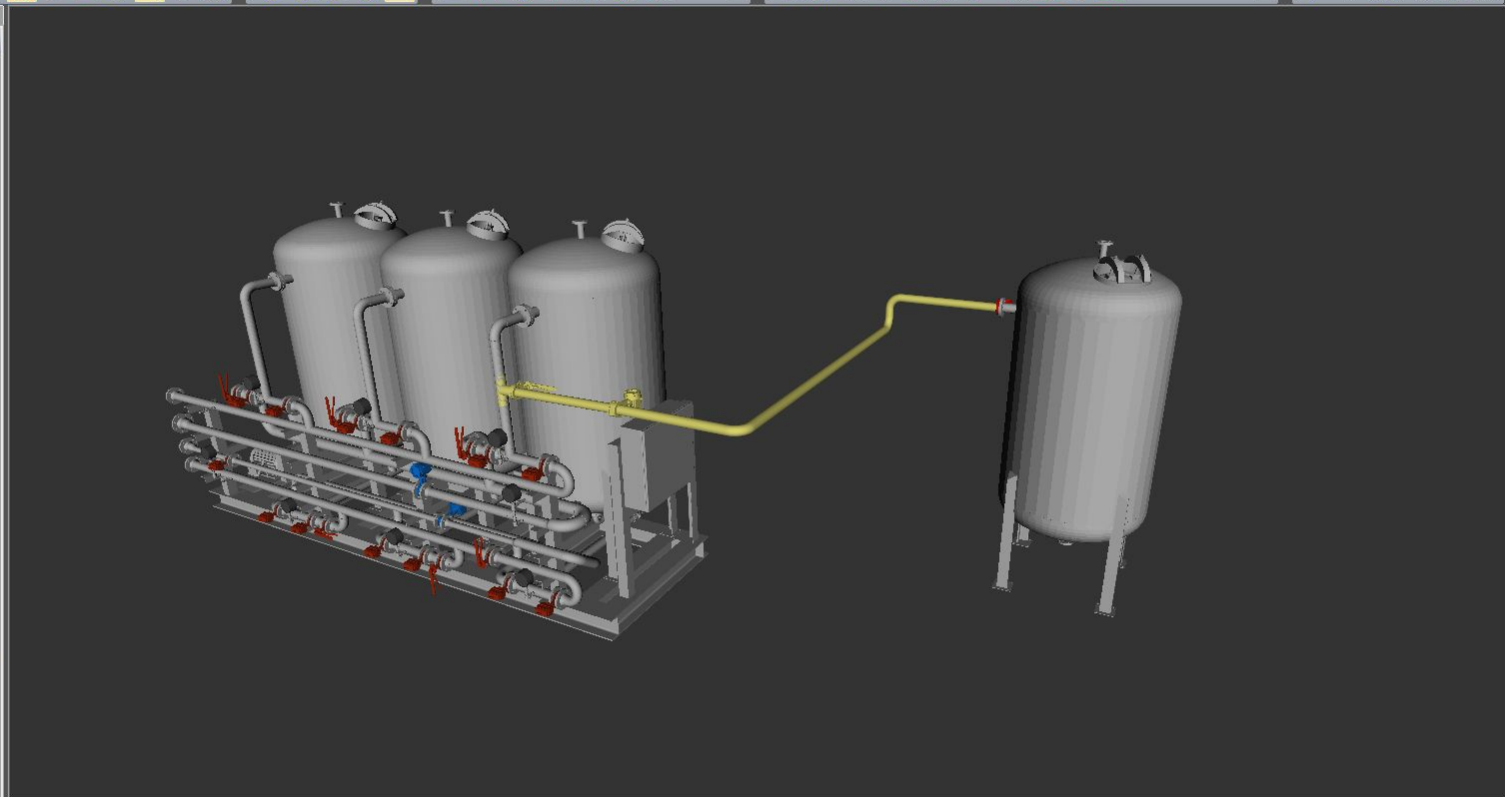
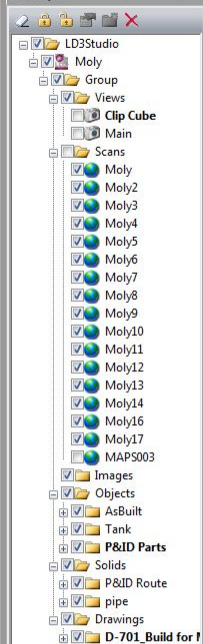
Output



OnPaint system failed.



LD3 Project



Properties



Property	Value
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Output

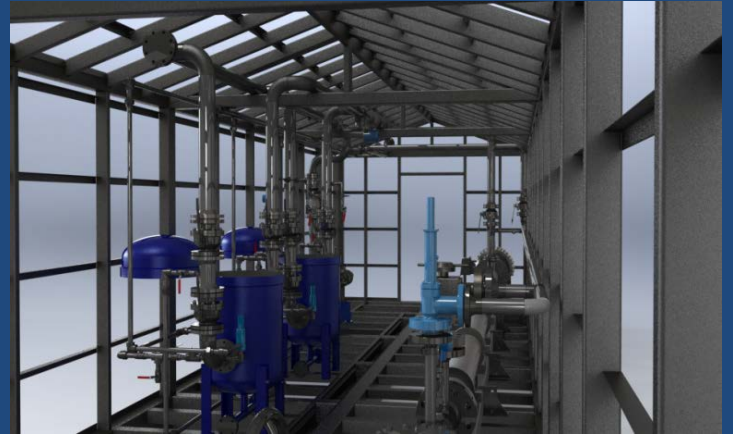


OnPaint system failed.

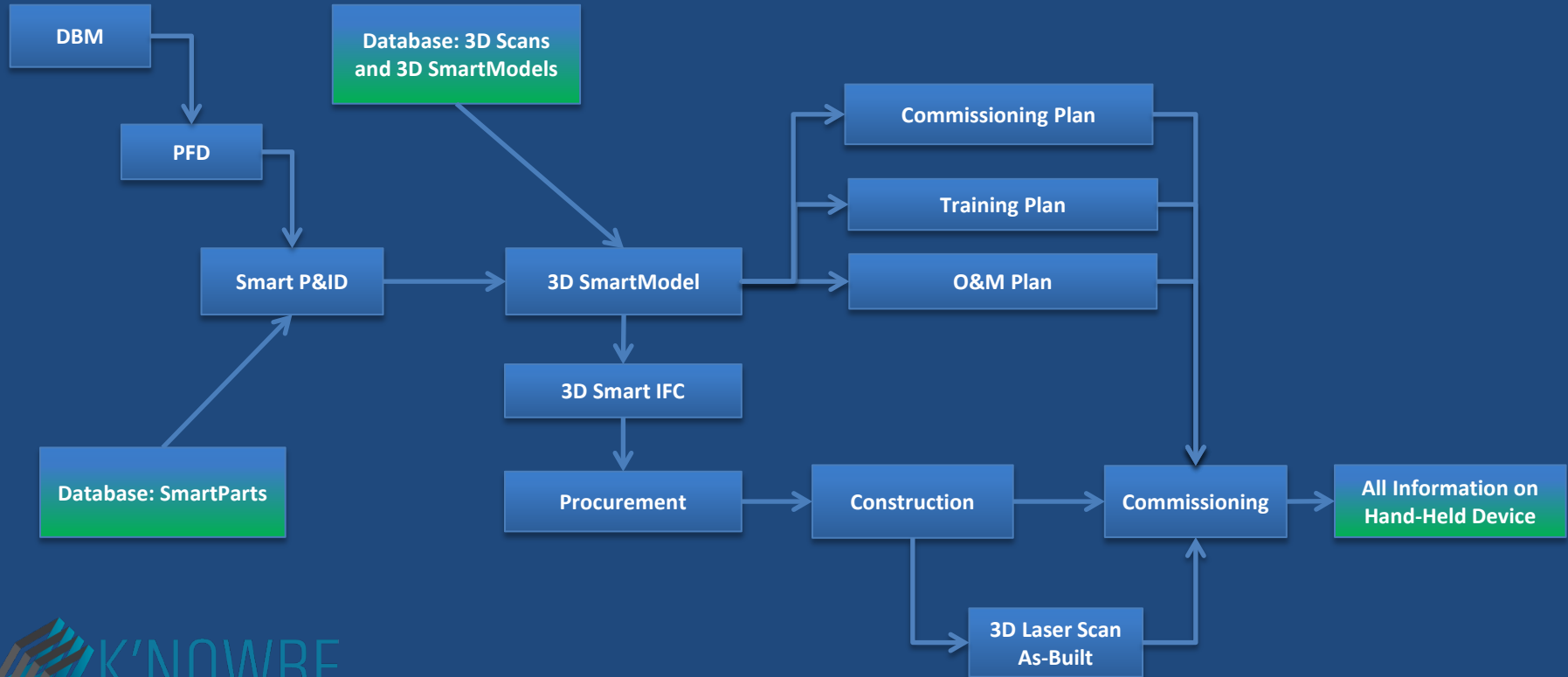
CASE STUDY #2 – EXPAND PAPER PLANT

3 ELEMENTS COMBINE IN EPC GAME-CHANGER

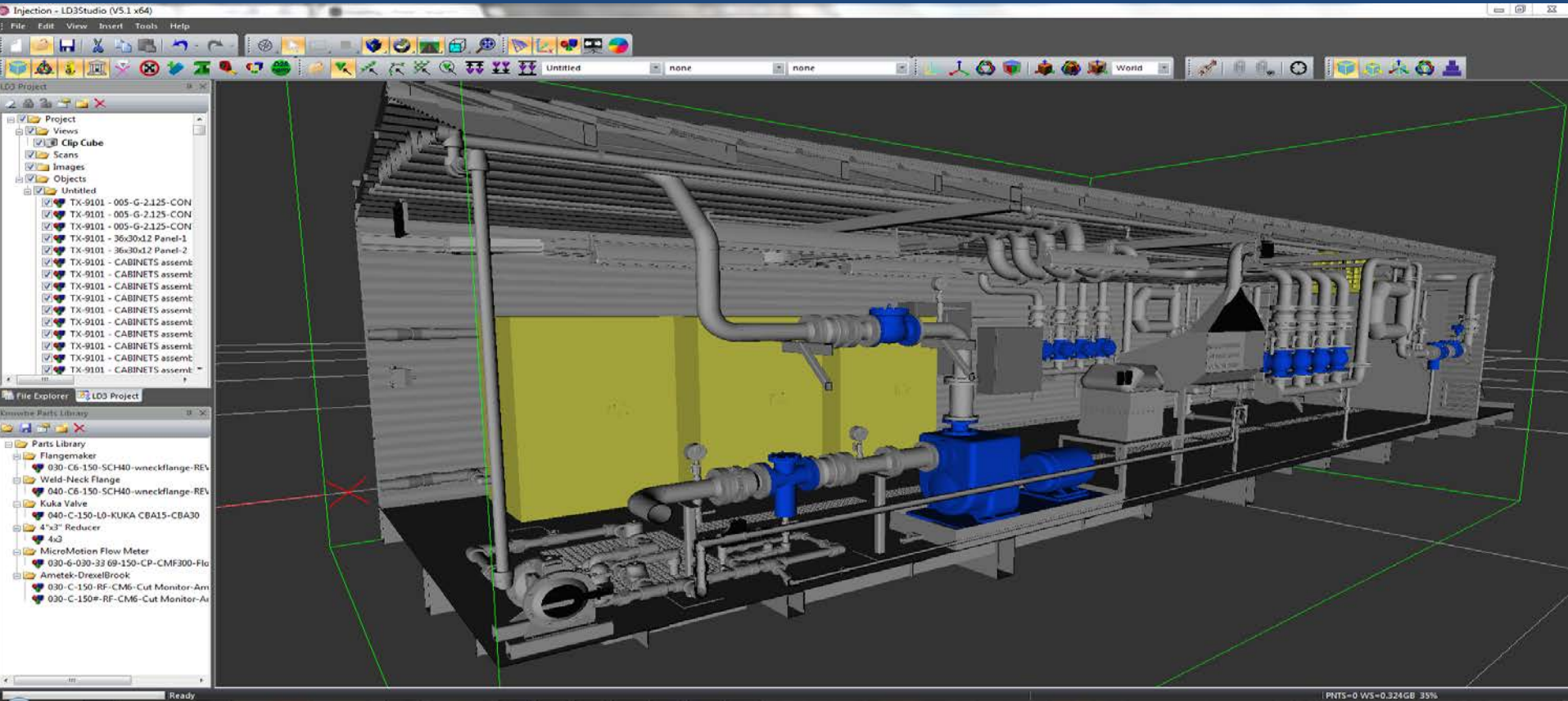
1. Automation of Workflow
2. 3D Design Platform
3. SmartPart Database



K'NOWBE WORK-FLOW - GREENFIELD



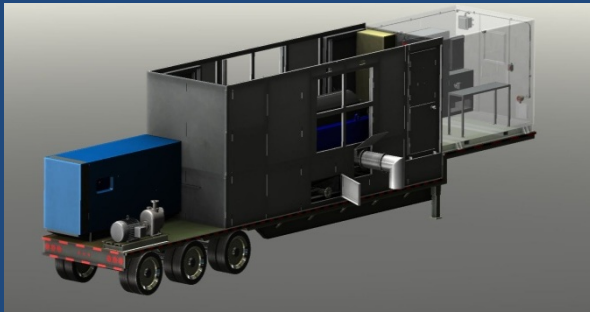
RESULT: FASTER, INTELLECTUAL PROPERTY - RICH DESIGNS



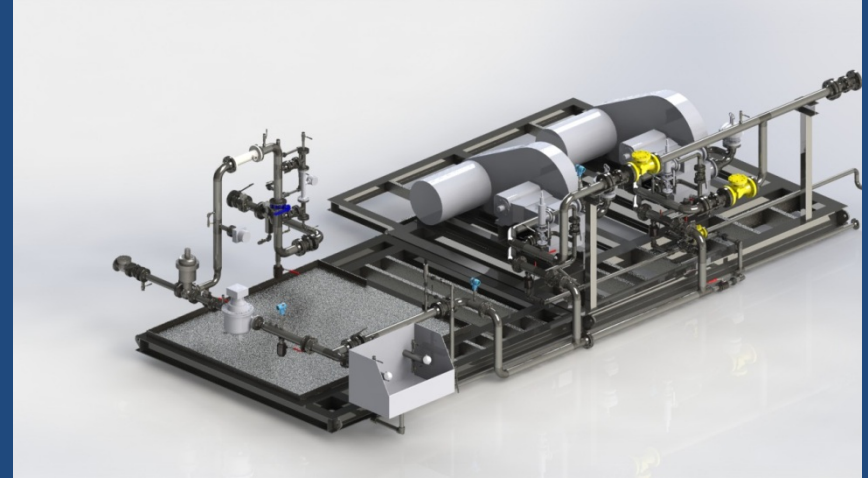
CASE STUDIES

1. Oil-Shale Refinery: 3D Scan and Model
2. SAGD Desilicizer: Design
3. Shale-gas/shale-oil Mud Recycling Trailers: Scan-Design-Build-Operate
4. Lease Automated Custody Transfer Unit: Configured Order Tool
5. Water Injection Facilities: Scan-Design-Build-Operate
6. Frac Water Supply Pumping System: Design-Build
7. OTSG Feed Water De-oiling (SAGD): Design
8. Brine Pond Clean-Up
9. MFT Tailings Modules: Design
10. Flowback Water Recycle: Design-Build
11. Gas Plant: Scan-Design

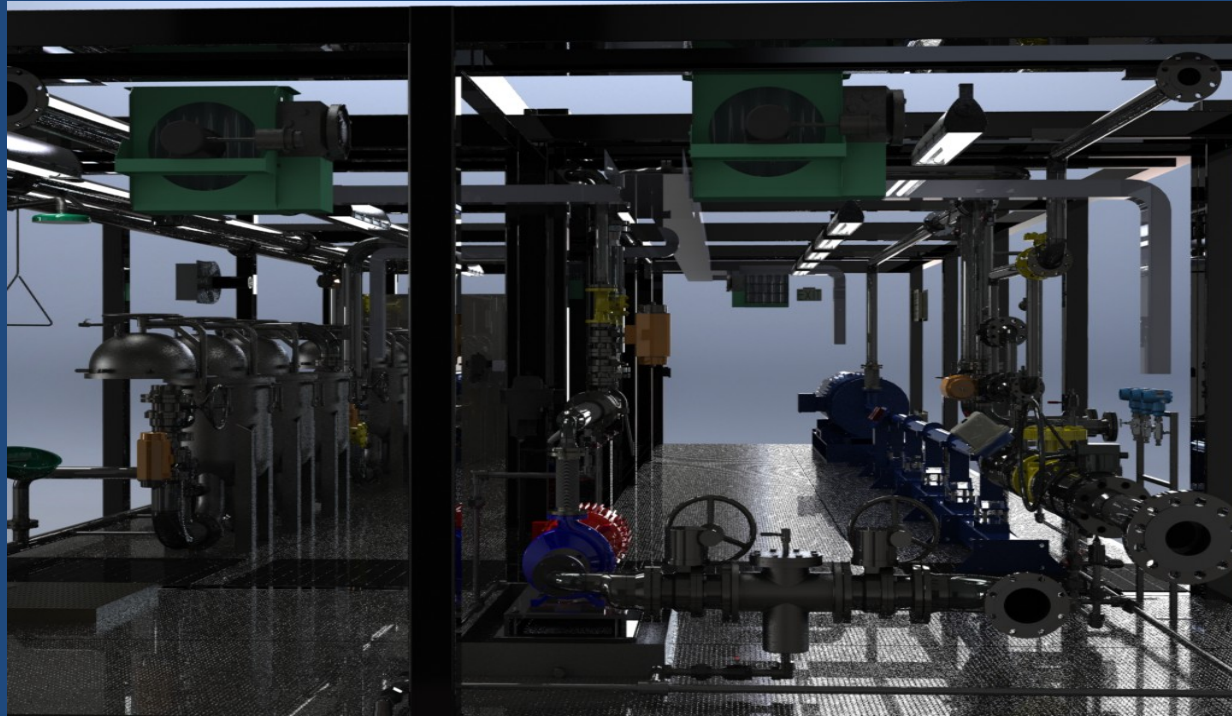
Drilling Mud Recycling Trailer – EPC 25 weeks

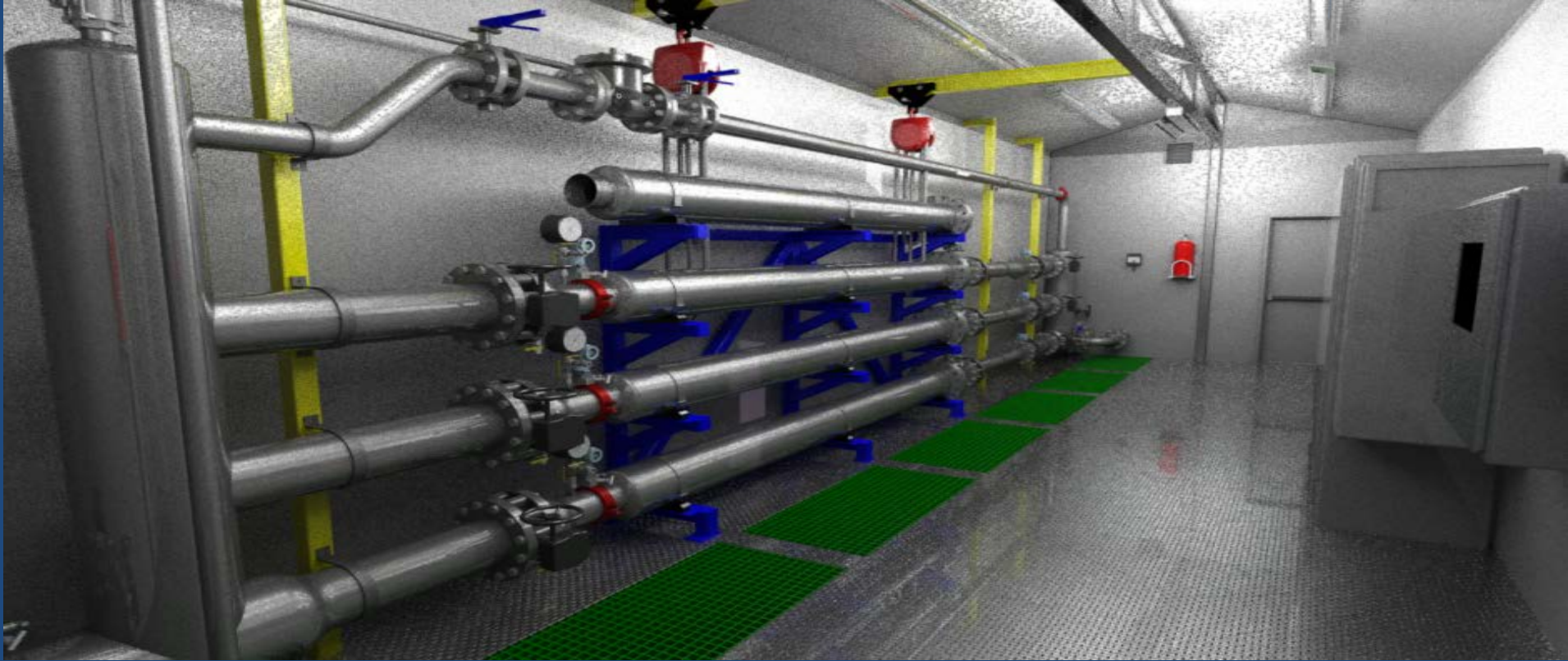


LACT CONFIGURATOR – 2 WEEKS



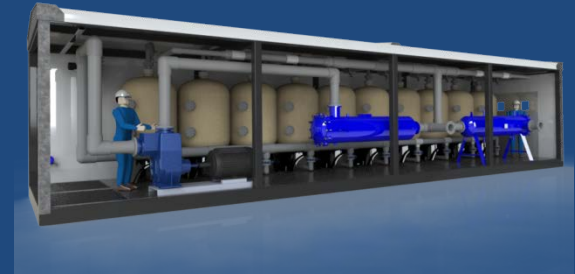
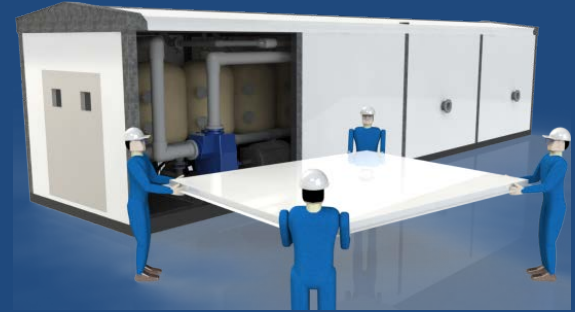
3,500 PSI WATER INJECTION MODULE DESIGN – 10 DAYS



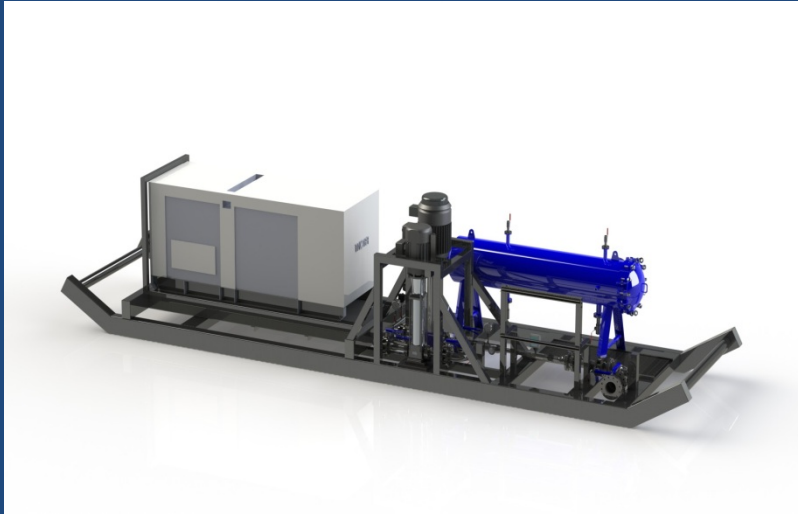


10,000 M3/DAY FRAC WATER SUPPLY DESIGN-BUILD-INSTALL 20 WEEKS

OTSG FEED WATER TREATMENT DESIGN – 10 DAYS



Frac Water Supply 1,500 m³/day Design-Build in 8 Weeks



BRINE POND DEWATERING/INJECTION: \$1 MILLION PROJECT, \$400,000 MARGIN

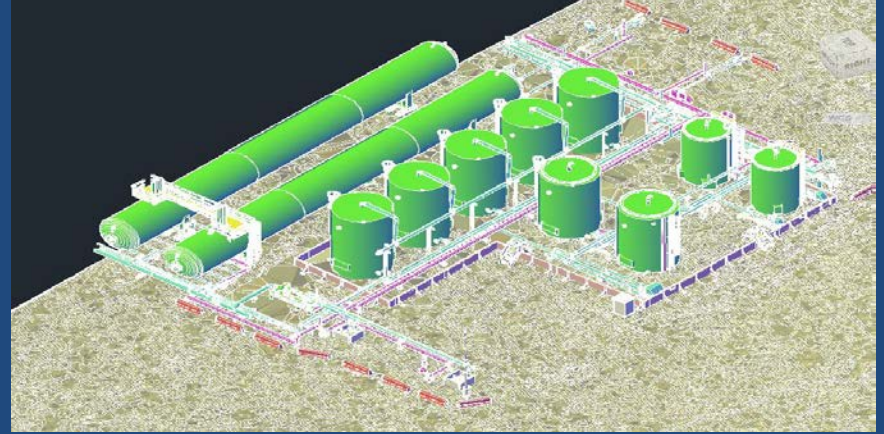
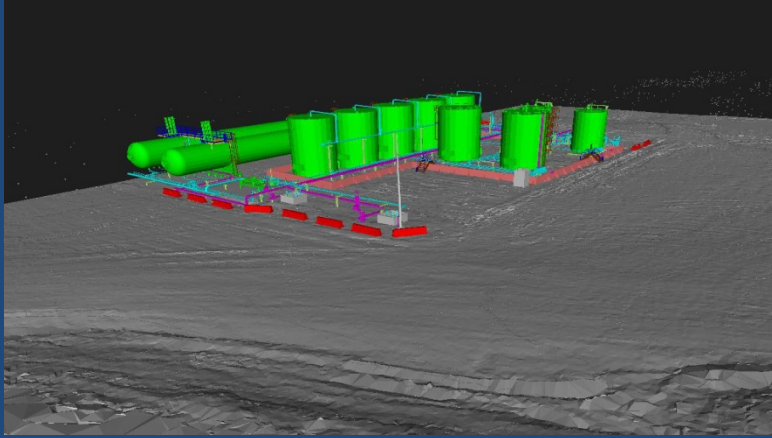




MFT CENTRIFUGE MODULARIZATION CONCEPT – 2 DAYS



19 M³/MIN FRAC WATER FLOWBACK RE-USE - DBO IN 12 WEEKS



TANK FARM EXPANSION - LASER SCAN-MODEL IN 2 WEEKS

SUMMARY

- Faster time-to-market requires new workflow
- Gamechanger uses automation and 3D design tools
- Use 3D scanning and 3DSmartModel for retrofit of facilities
- Write software apps and plugins that “boost” traditional software
- Result - custom designs at off-the-shelf price and speed
- Benefit - competitive advantage in capital project execution

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