



Dynamic Digital Twins

**THE PAST, PRESENT AND FUTURE STATE OF NETWORKS WITH
DATA DRIVEN AND PHYSICS BASED MODELS**

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A close-up, high-speed photograph of water splashing, creating intricate, crystalline patterns. Several small, bright red dots are scattered throughout the water droplets, possibly representing sensors or data points in a digital water management system.

Operational Opportunities for Digital Transformation

Water Distribution

- Predict service failures
- Minimize time without supply
- Identify/locate bursts
- Manage leakage
- Reduce pumping costs
- Manage pressure & water quality
- Optimize energy & cost of water treatment

Wastewater & Stormwater

- Predict/reduce overflows
- Predict/manage flooding
- Reduce pumping costs
- Optimize use of storage
- Manage wastewater treatment plant flows & efficiencies

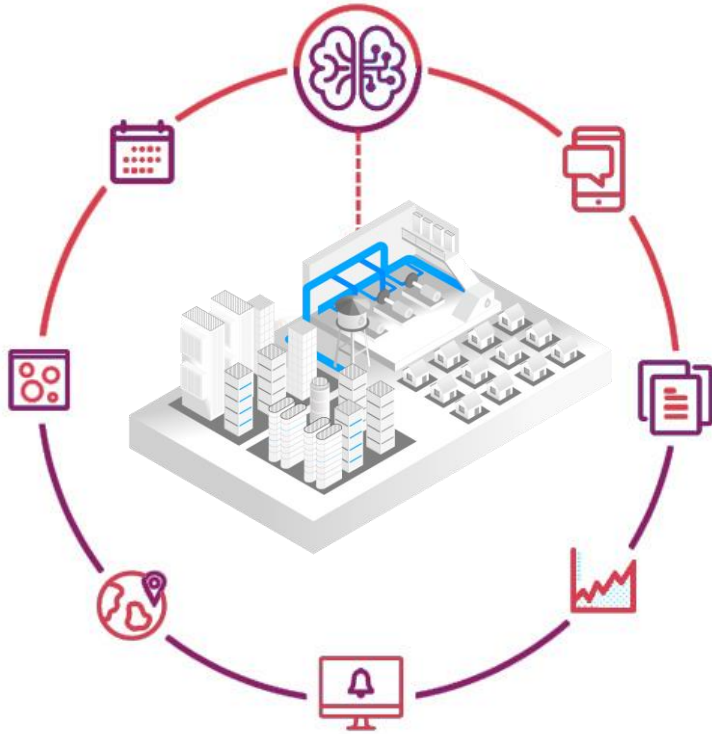
Barriers to Transformation

Incomplete, siloed information, not shared across departments

Standalone modeling and simulation tools not tied to operational KPIs

Generic analytics and BI tools require expensive customisation

Uncertain/excessive costs and implementation timelines erode ROI

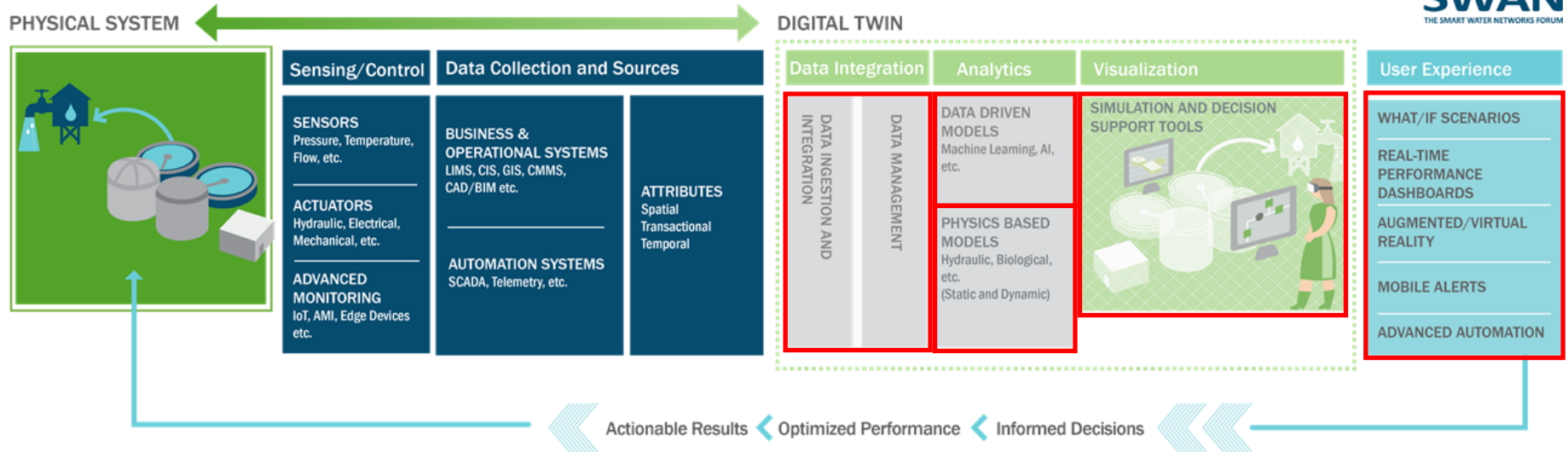


“A dynamic digital representation of real-world entity(s) and their behaviours using models with static and dynamic data that **enable insights** and interactions to **drive actionable** and **improved outcomes.**”

SWAN Forum



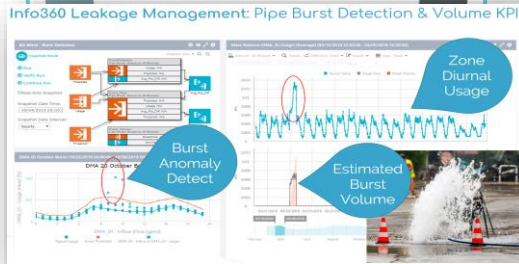
SWAN Digital Twin Architecture



Time Horizon, Models Utilised & Problem Solving with Digital Twin

Past

Data Driven Model for KPIs

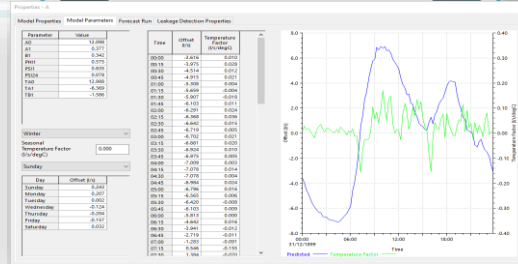


PAST (1-24 Hours)

Incident Reporting, 24/7 Monitoring, Compliance Reporting, Pump performance, Maintenance Programs, Asset Condition & Capacity

Present

Data Driven & Physics Based Model for Incident Management

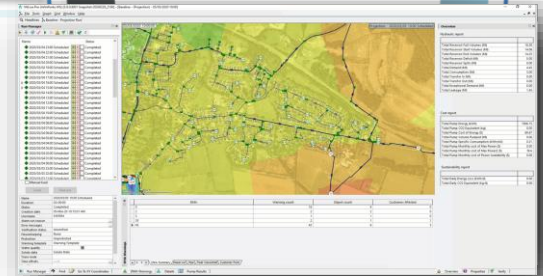


PRESENT (NOW)

DMA and Water Loss Management, Operations and Energy Optimisation, Incident & Forensic Analysis

Future

Data Driven (ML, AI - MPC) & Physics Based Model for Predictive Recommendations



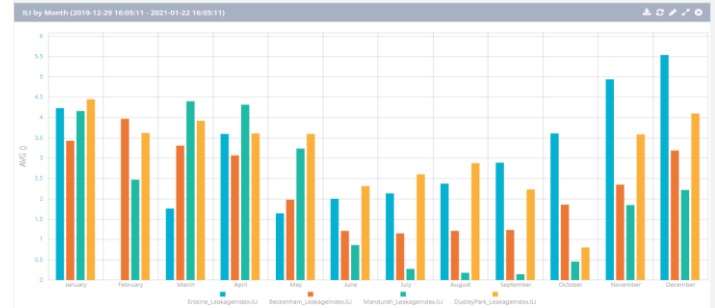
FUTURE (4-6 Hours, 5-7 Days)

Proactive Network Management, Contingency Planning, Energy Reduction & Maintaining Compliance

Water Corporation deployment and implementation of Smart Water Network (SWN)

Data Driven Model with Performance Dashboard:

“Understand how the pressure & flow management might impact global key performance indicators such as ILI”

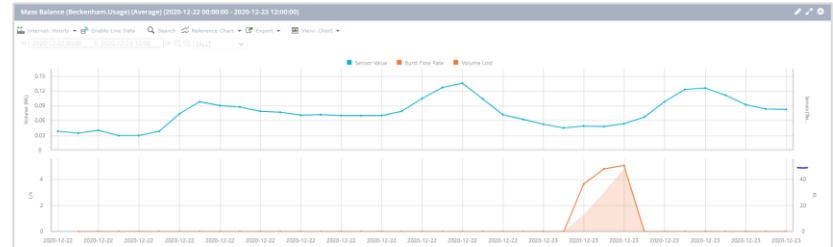


Continuous Performance Tracking

- Effectively query telemetry data to determine and rank leakage performance across DMAs

Simulated Burst Test & Detection

- Analytic approach was proven capable of identification and volume estimation



Water Corporation deployment and implementation of Smart Water Network (SWN)

Physics Based Model with Operator Interface

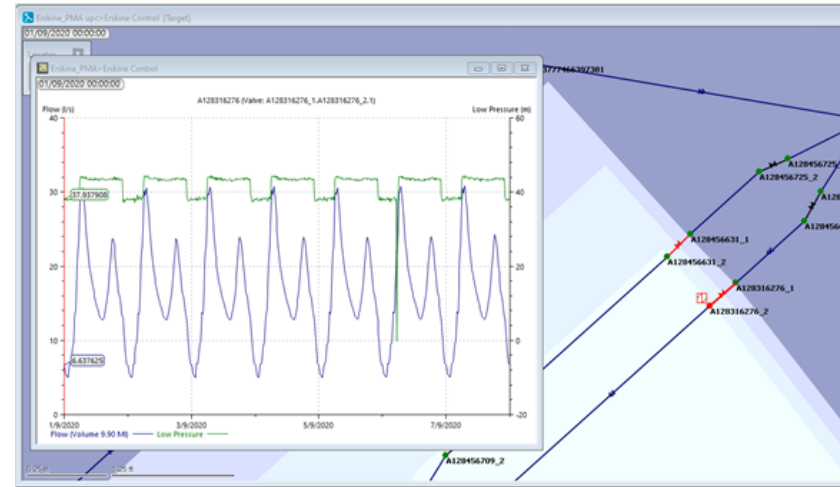
“Test the cost-benefit of having near real-time and predictive pressure and flow capability over and above existing practices”

Demand Forecasting Using Machine Learning

- Fully integrated with the live hydraulics for predictive modelling

Live Model for Pressure Optimisation

- Operational scenarios prior and during control room/field implementation



North American Utility optimises chemical costs while maintaining compliance

Innovyze AI Approach:

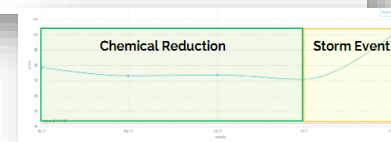
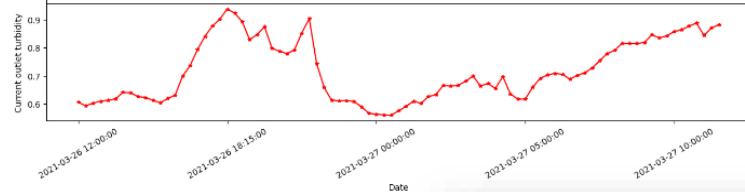
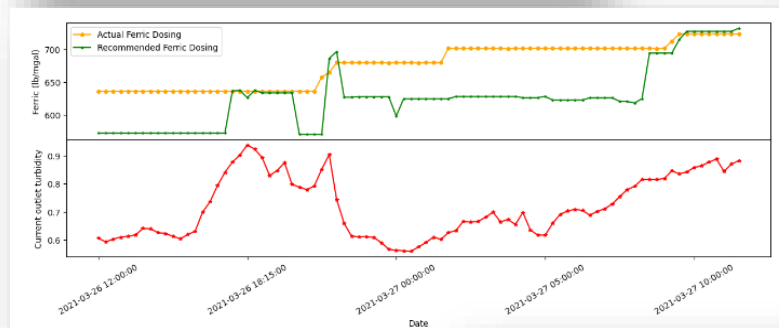
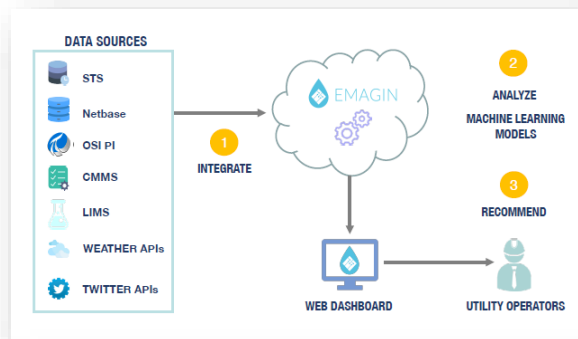
Utilising Model Predictive Control (MPC) to optimise chemical dosing of the water treatment plant

KPIs:

- Reduce ferric chloride consumption per ML of treated water
- Maintain effluent compliance limits (Turbidity <1 ppm)

Highlights:

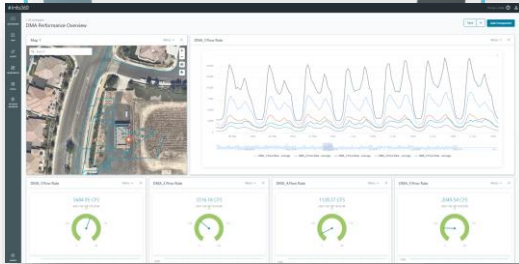
- Value Based, ROI of 6-Months
- Predictive, Real-Time Recommendations
- OPEX savings of 13% (US\$ 170K) in ferric costs while meeting turbidity discharge compliance limits
- Resilience against heavy Rain & Storm



Time Horizon, Models Utilised & User Interactions with Digital Twin

Past

Data Driven Model for KPIs

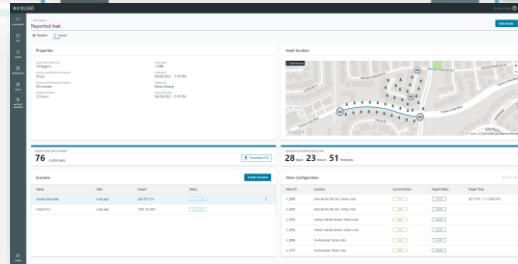


User Built Workspaces

Utilised on a daily basis includes mapping, geospatially located sensors, alert mechanisms and workspaces the user can build based on the needs of specific persona types within an organisation.

Present

Data Driven & Physics Based Model for Incident Management

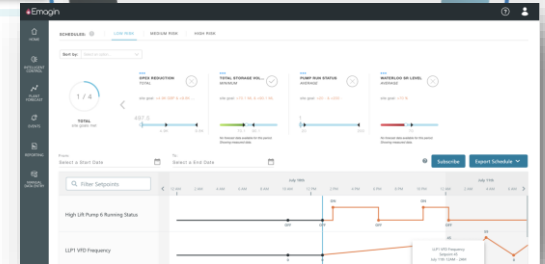


“What-if” Scenarios

“What-if” operational scenarios: What are the implications of changing a control within the system? What valves to close for this incident? What areas of network to isolate to minimise disruption?

Future

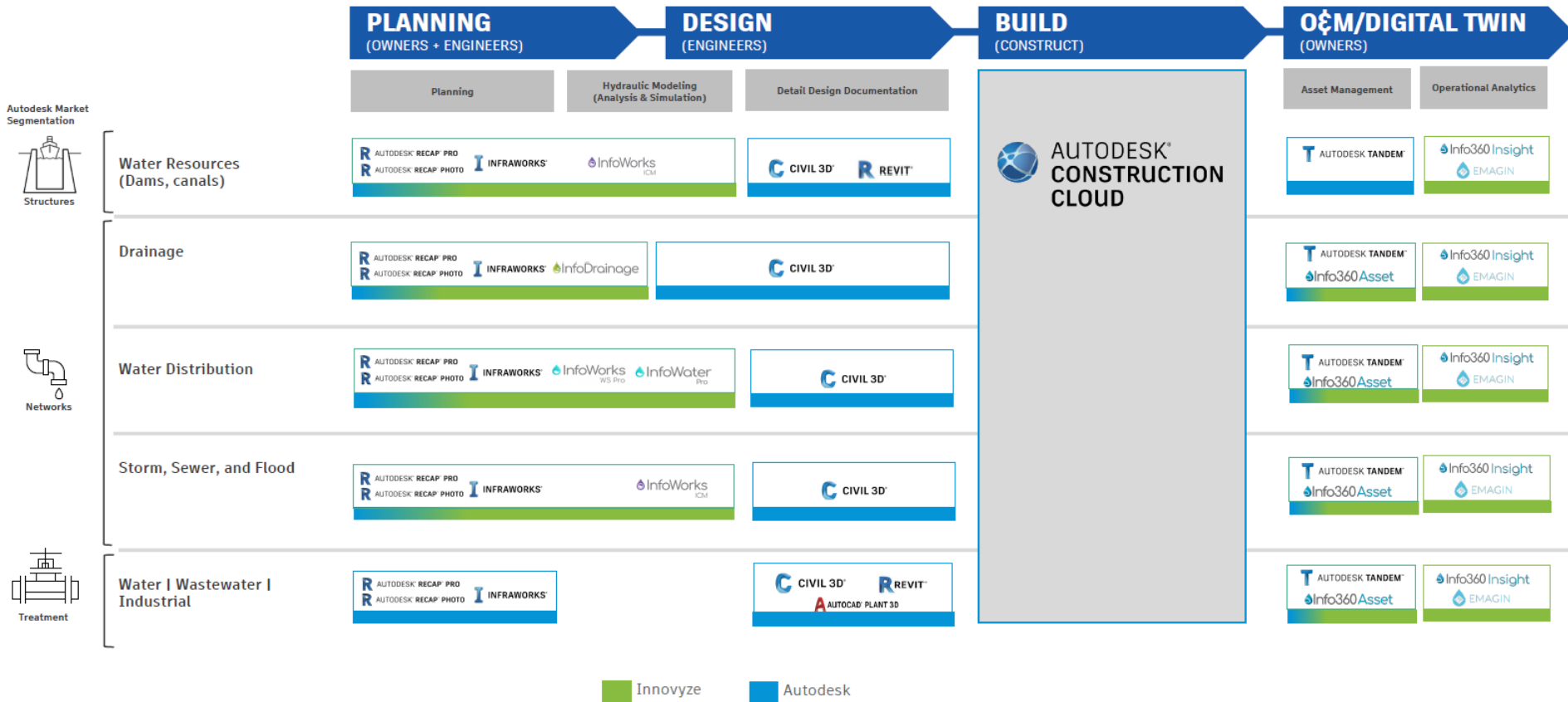
Data Driven (ML, AI - MPC) & Physics Based Model for Predictive Recommendations



Predictive AI Recommendations

Predictive recommendations and control schedules for Energy and Chemical Dosage reduction.

Coverage of the Water Infrastructure Asset Lifecycle



Info360 Platform

Water lifecycle management



Info360



Unified and Integrated Suite for Water to Deliver a Dynamic Digital Twin

Ease of Adoption

+ **Digital Twin Scalability & Shared Services**

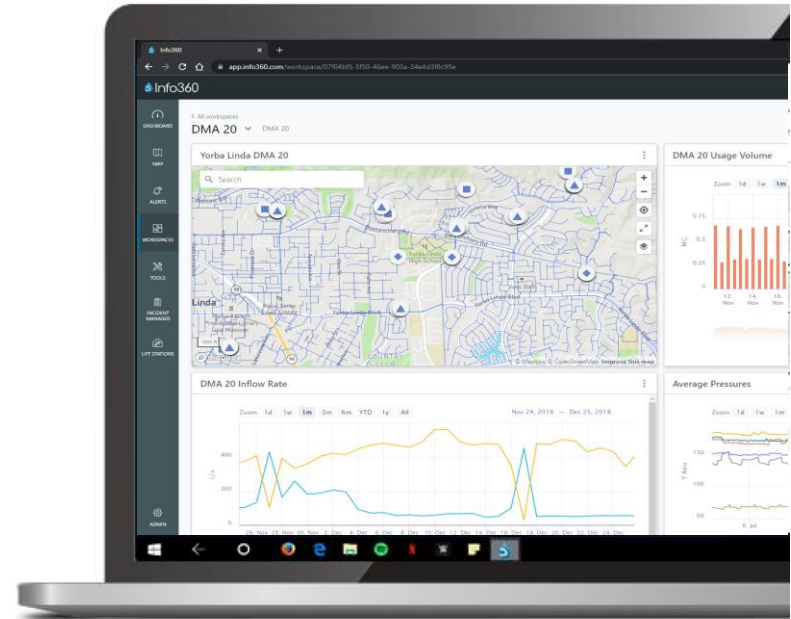
Increased compute power & cohesive workflows with data model combinations.

+ **Remote Install & Remote Access**

Log-in and connect to the system from anywhere.

+ **Conserve Costs on your Existing Budget**

Reduction of Energy & Chemical Costs while maintaining compliance without having to request new budget.





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