



# Accelerating Digital Transformation

Leveraging Enterprise AI with Process  
Technology and Domain Expertise to gain a  
sustainable competitive edge

## Who We Are

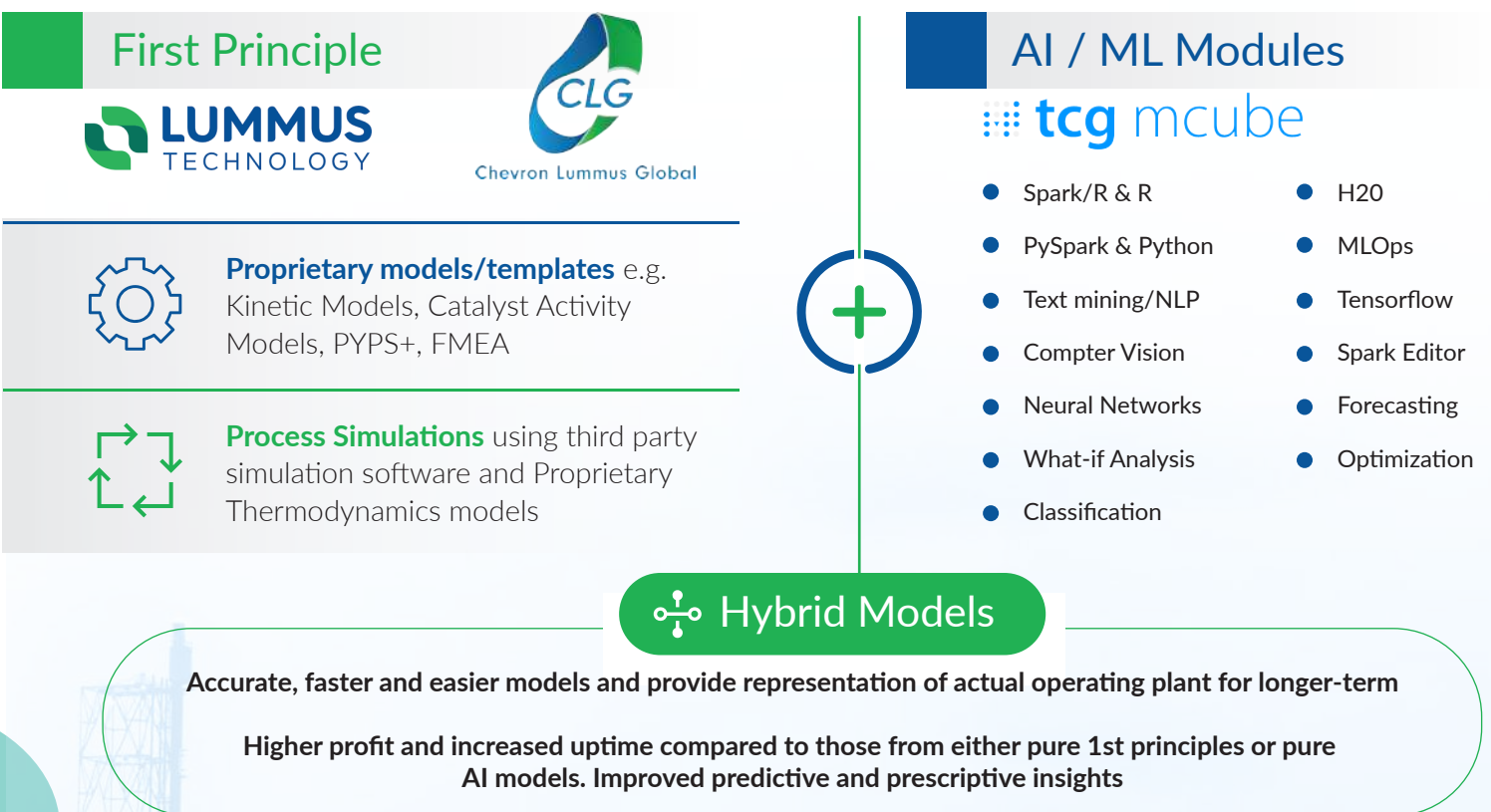
Lummus Digital maximizes plant performance and asset value for refining, petrochemical, and gas processing operators by combining artificial intelligence (AI), process technology licensing and domain expertise to accelerate sustainable digital transformation. We are a joint venture between Lummus Technology, an industry leading process technology and services company and TCG Digital, a digital transformation and artificial intelligence company.

# Our Key Strengths

	<b>AI Platform: tcg mcube</b> Scalable, Secure, Cloud agnostic, On-Premise – Solves <b>Productivity, Complexity and Cost Efficiency Challenges</b>	<b>Hybrid Models</b> First Principle including proprietary models and AI models – <b>More Accuracy and Represent Actual Plant</b>	
	<b>Pre-built Digital Solutions</b> Velocity to Value – <b>Quick and Large Returns</b>	<b>Advisory Services</b> Recommendations by our Technology and Domain experts using our solutions output – <b>Action Oriented</b>	

## Digital Solutions: Hybrid Models

Powered By: AI + 1st Principles Modelling Approach



## Digital Solutions Enabler: tcg mcube - AI Platform

Data Ingestion	Big Data Store	Data Management	Artificial Intelligence
Data Contextualization			Data Publishing APIs
Business Intelligence	Real time Capability	Platform Services	AI Use cases

- From data ingestion to rich AI/ML algorithms libraries
- Integration with disparate OT & IT data sources
- Contextualization and data hierarchy
- Large library of AI/ ML algorithms
- Mature alert and event management and customized UI

# Our Digital Solutions Portfolio



## Monitoring and Improvement

**REMOTE PERFORMANCE MONITORING:** Monitors plant health remotely by tracking KPIs, diagnosing the problems, identifying the root causes and recommending the actions for.

**LUMMUS VIRTUAL HEATER (LVH):** Monitors the heater performance and its conditions, detects any hot spots and flame impingements on the tubes, prescribes enhancing heater performance including heater run length and tube reliability, and maximizes tube life.



## Process Optimization

**REAL TIME OPTIMIZATION (RTO):** Maximizes the profit, yield, and production at minimum energy consumption using hybrid RTO. Implements Advanced Process Control (APC) for closed loop RTO that pushes the plant towards boundaries in controlled environment.

- Profit maximization
- Yield maximization
- Production maximization
- Energy minimization
- Products Sequence Optimization
- Blending Optimization



## Performance Prediction

**OPERATIONS PERFORMANCE PREDICTION:** Predicts, detects anomaly, and avoids process system upsets:

- Equipment fouling, foaming, high coking
- Catalyst abnormal degradation and remaining life
- Offspec and poor quality of products

**ASSET PERFORMANCE MANAGEMENT:** Predicts, detects anomaly, manages failure and enhances equipment life:

- Rotating equipment – Compressors, pumps etc.
- Static equipment – Exchangers, heaters etc.
- Corrosion detection using image analytics



## Integrity and Sustainability

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# Benefits of Our Clients

Drag-and-drop approach helps develop models using no-code/ low-code capability

First Principle Engineering establishes the fundamentals of plant and assets

Remote Performance Monitoring monitors total carbon emissions and detects its sources

Real -Time Optimization (RTO) helps in reducing carbon emissions

Condition Monitoring Maintenance identifies specific failure mode to repair and validate maintenance

Plant Performance Prediction identify root causes & recommend actions to reduce unplanned shutdown

Identify debottlenecking opportunities

Typical payback less than 6 months and ROI 7-10 times



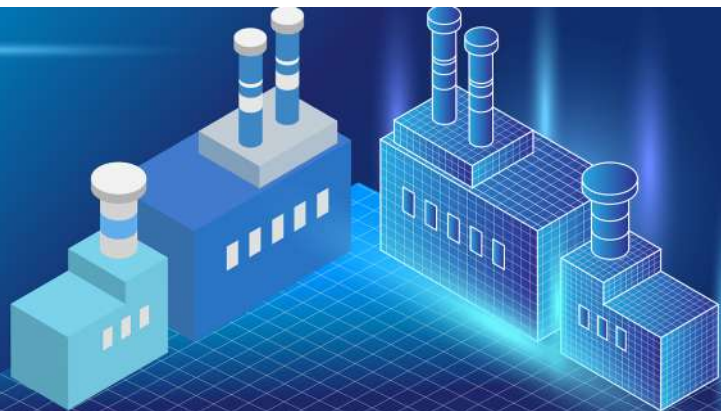
# tcg mcube Differentiators

- Highly scalable and adaptable platform
- Pre-built and templating of solutions for faster delivery
- No code/ Low-code enabled by an intuitive drag-and-drop interface
- Edge to cloud – on-premise, private/ public cloud for cost efficiency, flexibility and security

## Our Digital Solutions

### Value Proposition

Intelligent Virtual Replica of Plant combining multiple Solutions



Gives a comprehensive visual view of operating plant



Monitors current state and improves plant performance



Optimizes performance by safely pushing the plant to its boundaries



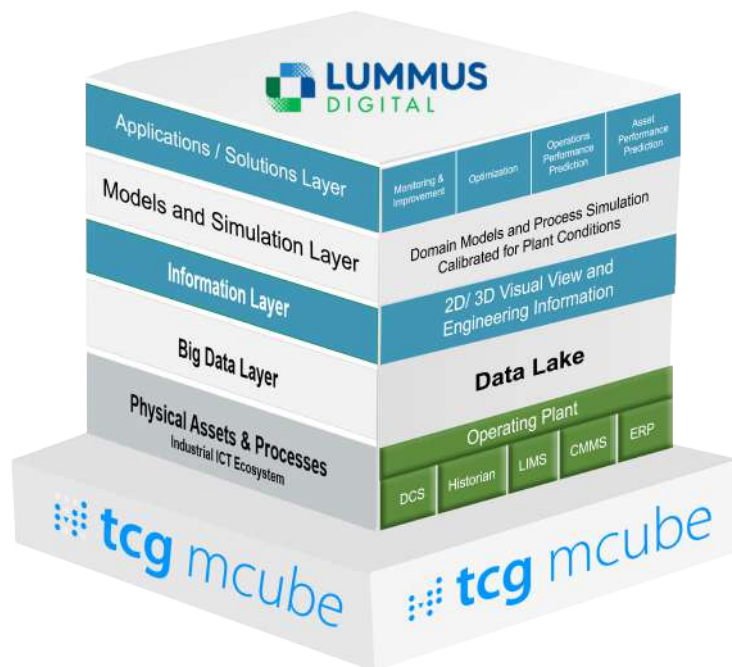
Detects issues early on and avoids their occurrence in the plant



Allows human-machine interaction to improve plant performance remotely

## Integrated & Modular Digital Twin

Using tcg mcube as Base AI Platform



Consists of stack of base layers over which various applications / solutions are built



Digital Twin can have one or more applications depending on the requirements and it becomes a comprehensive tool for solving most of the plant needs.

