Optimizing Biopharmaceutical Manufacturing with AI:

A Case Study on **ADMAlytics**™
powered by mcube™

Discover how **ADMAlytics™**, powered by **mcube™**, is bringing about a transformative impact on the biopharmaceutical manufacturing processes at ADMA Biologics.

From optimizing plasma pool efficiency, donor & inventory management, and yield prediction to enabling real-time KPI monitoring and GenAI-powered enterprise search — this AI-driven platform delivers breakthrough gains in production efficiency, data accessibility, and decision-making.

BACKGROUND

ADMA Biologics + TCG Digital: Driving Biopharma Innovation

Amid rising manufacturing and regulatory challenges, ADMA Biologics partners with TCG Digital to transform its operations using the mcube™ platform.

The Goal: To develop a data-driven ecosystem that tackles key operational hurdles, automates manual processes, and fuels continuous innovation and efficiency.

METHODOLOGY

Building ADMAlytics™: A Data-Driven Approach

Through cross-functional workshops at **ADMA Biologics**, TCG Digital identified key operational challenges to design the **ADMAlytics™** platform.

Key Focus Areas:

• Plasma unit selection for optimal batch yields
• Hyperimmune donor & inventory optimization
• Real-time KPI monitoring & outlier detection
• Generative AI-powered document reconciliation & enterprise search

ARCHITECTURAL OVERVIEW

ADMAlytics™ Architecture: Built for Intelligent Impact

At its core, **ADMAlytics™** is powered by an enterprise **lake house**, unifying data from multiple sources to drive business outcomes. This architecture boosts **data access**, **quality, scalability, and profitability —** while cutting costs and breaking silos to fuel innovation.

Built on **mcube™**, the platform spans four key layers:
Ingest | Storage | Analyze/Predict | Visualize — utilizing open-source, best-in-class technologies.

A strategic leap toward automation, traceability, and smarter decision-making

SOLUTIONS DEPLOYED

Plasma Pool Optimization
Smarter Plasma Pooling. Real-Time Impact.

- Optimized pooling using mixed integer programming
- Factors in age, titer, CFR compliance, expiry, and volume
- Cuts manual effort, improves accuracy and productivity
- Enables real-time adjustments based on inventory and demand/supply
- Transforms a critical manufacturing step with intelligence

> Implementing the plasma pooling process, which historically has been a very manual process, has immediately realized efficiencies for the supply chain functions at ADMA. These efficiencies include the reduction of FTE hours required to construct these pools, assurances that the most efficient mix of plasma is used for each product, and a standardization that could not be achieved through manual pool construction.
>
> Robert Brooks, Director of Data Integrity and IT Operations, ADMA Biologics

Transforming the Plasma Donor Onboarding Process
Smarter, Faster, Data-Driven Onboarding

- Automates donor identification and titer-based program assignment
- Performs statistical titer calculations and drop notifications
- Keeps the data lake updated in real time
- Enhances plasma inventory visibility and reporting efficiency

> By optimizing the donor onboarding process, ADMAlytics™ is poised to not only improve the efficiency of plasma donation and inventory management ensuring precision and accuracy through a validated process
>
> Robert Brooks, Director of Data Integrity and IT Operations, ADMA Biologics

Real-Time KPI Monitoring & Outlier Detection
Instant Insights. Quality Assured.

- Dynamic dashboards provide real-time KPI visibility
- Uses advanced statistical algorithms to detect outliers
- Ensures regulatory compliance and batch quality
- Streamlines end-to-end manufacturing operations

Predictive Yield Optimization
Boost Yields. Cut Waste. Maximize Margins.

- Advanced ML models predict batch yields from historical & real-time data
- Enables proactive adjustments for better outcomes
- Drives higher yields, less waste, and smarter decisions
- Optimizes procurement, scheduling, and logistics
- Enhances efficiency, cost savings, and batch margins

> Enhancing visibility over the 7-12 month plasma product manufacturing process is key for the continued growth of our product portfolio. Being able to have Generative AI predictors provides ADMA the opportunity to plan for forward looking commercial enhancements, proactively.
>
> Adam Grossman, President and CEO, ADMA Biologics

Generative AI for Enterprise Search
Fast. Context-Aware. Collaborative.

- Combines Generative AI, NLP, and ML for smart search
- Delivers fast, context-aware search across ADMA's data
- Boosts efficiency and knowledge sharing
- Frees time for high-value work
- Fosters a culture of innovation and collaboration

> The generative AI chatbot replaces our manual method of searching in documents for information using traditional eQMS search bars and allows an interactive and natural language driven approach to finding information. We are excited to see how this shapes how our knowledge repository is leveraged and the speed at which information can be found using this new tool.
>
> Robert Brooks, Director of Data Integrity and IT Operations, ADMA Biologics

Conclusion

> ADMA's collaboration with TCG Digital underscores a commitment to leveraging cutting-edge technology to address complex operational challenges. ADMA Biologics' adoption of TCG Digital's mcube™ AI platform marks an important milestone in biopharmaceutical manufacturing by setting new standards for efficiency, productivity and innovation. This initiative has successfully addressed key challenges, including the integration of disparate data sources, breaking down organizational silos and scaling the data architecture for future growth. The value delivered by ADMAlytics™ exemplifies the potential of AI and advanced analytics in driving the next wave of innovation in biopharmaceutical manufacturing.

Debdas Sen
CEO, TCG Digital

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TCG Digital is the flagship data science and technology arm of The Chatterjee Group (TCG), a multi-billion-dollar global conglomerate. With 'Velocity to Value' as its mantra, TCG Digital drives enterprise digital transformation through its advanced intelligence and AI platform: mcube™, its global expertise and access to 1,000+ digital minds. With proven agility, deep domain knowledge, and enterprise-ready solutions, TCG Digital is trusted by top pharma companies, government bodies, and mid-sized firms, as it delivers rapid, measurable ROI and sustainable innovation.

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mcube™ by tcgdigital

mcube™ is a cloud-agnostic, highly scalable, and extensible AI platform built for high-speed, high-volume data. It supports both on-premise and cloud deployments, with distributed architecture for seamless horizontal scaling.

Key Features: • Scalable Data Lake • Polyglot Cloud Ready
• Comprehensive Data Integration • Low-Code AI Workflow
• Robust AI/ML Engine & libraries

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