

4IR Technologies:

**AI, IoT, Edge computing,
Cloud computing**

Emirate:

Abu Dhabi, Dubai

Maturity:



Scaled Deployment

Type:

Private

MANUFACTURING

010

AI-Driven Transformation of the World's Largest Premium Aluminium Producer

ACTORS

**Emirates Global Aluminium
WEF Global Lighthouse**

SNAPSHOT

Emirates Global Aluminium (EGA) has deployed over 100 AI and data use cases across its Al Taweelah smelter in Abu Dhabi and its Jebel Ali smelter in Dubai, generating USD 123 million in financial impact since 2021 and rewiring how the company runs procurement, supply chain, shopfloor operations, sales, and treasury.¹² The programme was delivered in 10 waves of 12-week agile sprints by a dedicated 47-person centre of excellence working alongside business product owners.³ In January 2025, the World Economic Forum designated Al Taweelah as a Global Lighthouse, making EGA the first industrial company in the UAE and the first aluminium company in the world to receive the designation.⁴

WHY IT MATTERS

Aluminium smelting runs continuously. Reduction pots operate around the clock at extreme temperatures. Cranes perform millions of activities per year, each one following strict standard operating procedures where a single deviation can damage a pot or create a safety hazard. Operators walk long distances across vast shopfloors to monitor equipment, enter data, and respond to alarms. Procurement manages volatile commodity markets. Treasury allocates cash across 30 entities and 150 accounts in 15 currencies. Every one of these domains was historically managed through manual processes, spreadsheets, and reactive decision-making.⁵

EGA made a strategic choice to build its own AI solutions rather than buy off the shelf, because off-the-shelf products did not fit the specific demands of aluminium smelting. The result is a transformation that covers every domain of the value chain, delivered in-house, with each wave building on the foundations of the last. The incremental time to add a use case has decreased with every sprint as the data platform, governance, and workforce capability matured.⁶

100+
AI USE
CASES

deployed across
EGA's smelting
operations

92%
REDUCTION

in operator reaction time



HOW THE TECHNOLOGY WORKS

On the shopfloor, a neural network trained on 60,000 frames monitors crane operations across 2,843 reduction pots. The Smart Cranes system tracks nine million crane activities per year performed by over 5,000 operators, detecting compliance deviations during anode setting in real time and alerting operators before deviations damage pot health. A separate computer vision system auto-inspects green anodes at the paste plant with 98% model accuracy, flagging and auto-rejecting defective anodes before they reach the potlines and cause downstream failures.⁷

An in-house mobile application replaces the paper-based, walk-the-floor operating model. Shift attendance, checklists, pot alarm monitoring, data entry, and breakdown tracking run through a single platform, digitising over one million operator activities per year and giving every shopfloor area real-time visibility from one device.⁸ In treasury, an AI-driven cash forecasting engine manages liquidity across 30 entities, 150 accounts, 15 currencies, and 3,000 monthly payments, replacing manual spreadsheet allocation with a 30-day AI model that optimises yield across the entire portfolio.⁹

The infrastructure layer makes all of this possible at speed. EGA's hybrid cloud runs AI models at the edge inside the smelter, with response times 13 times faster than cloud-only alternatives and analytics costs reduced by 86%.¹⁰ The company now processes 3,500 times more data annually than before the transformation, supported by over 3,000 Wi-Fi 6 access points and two 100% solar-powered, Tier 3 certified industrial data centres.¹¹

IMPACT AND RESULTS

AED 452 million (USD 123 million) in cumulative financial impact,¹² with over 100 use cases deployed to date and AED 129 million (USD 35 million) from 40 use cases in 2024 alone.¹³ The results break down across the value chain: 16% reduction in indirect procurement costs, 50% reduction in inbound logistics delays, 18% improvement in shopfloor productivity, 12% improvement in sales margin, and 12.5% improvement in investment returns through AI-driven cash forecasting.¹⁴ In January 2025, this programme earned AI Taweelah a place in the World Economic Forum's Global Lighthouse Network, the first such recognition for any aluminium producer.¹⁵

At the site level, operational downtime reduced by 50%, overall equipment effectiveness improved 12%,¹⁶ and operator reaction time was cut by 92%.¹⁷ More than 3,000 employees have been upskilled through EGA's digital academy.¹⁸ A Data and AI Community of Practice connects 161 members, 28 data ambassadors across business units, and 100 citizen data practitioners who build solutions alongside the central team.¹⁹



WHAT'S NEXT

Two new programmes are scaling across operations. Safety AI (SAQR) uses computer vision to detect personal protective equipment (PPE) compliance, safe distances from suspended loads, mobile equipment, and hot metal pouring across four industrial settings, with real-time mobile alerts to prevent harm before it occurs. An Agentic AI platform gives employees self-service access to operational data, safety analysis, root-cause diagnostics, and process optimisation through a unified enterprise agent marketplace.²⁰

EGA is also piloting EX, its tenth-generation smelting technology, at Al Taweelah, designed to produce more aluminium with less energy and lower emissions. The first cells started in July 2025, with performance exceeding expectations. EGA plans to apply EX to a new facility in Oklahoma, which would be the first new primary aluminium plant built in the United States since 1980.²¹

“Just over four years ago, we set ourselves a bold aspiration to lead the region and the global aluminium sector in Industry 4.0. Today advanced technologies at EGA are driving industrial process efficiency, quality, safety, and sustainability. I am convinced we are still just scratching the surface of what we can achieve,” said Abdunnasser Bin Kalban, Chief Executive Officer of Emirates Global Aluminium.²²

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