

CLOSING THE LOOP : REDEFINING FIRE CONTROL IN WASTE MANAGEMENT

**Autonomous Closed-Loop Thermal Fire
Suppression – with zero ongoing monitoring costs**

Presented by





THE PROBLEM

Lithium Battery Fires are Destroying Industrial Facilities Every Day

Industrial fires cost Australia's waste and recycling industry hundreds of millions of dollars every year, as fire incidents increase by 25% annually - driving asset damage, operational shutdowns and rapidly tightening insurance that threatens sector-wide profitability, asset values and business continuity.

Modern industrial fires no longer start as flames or explosions; they begin as invisible heat signatures, generated by Lithium battery thermal runaway, chemical blending, overheated machinery, friction hotspots or combustible dust. By the time smoke appears, it is already too late!

Consumer use of Lithium batteries continues to grow exponentially; so too does the massive accumulation of fuel materials in confined facilities.

This "perfect storm" poses ever-increasing risk to personnel, operating equipment, infrastructure, surrounding assets and the environment.

As many of these fires release toxic fumes, they result in substantial operational and community disruption, as well as reputational damage to the recycling and waste management industry.





THE SOLUTION



THERMINATOR® by Magnum combines intelligent thermal detection technology with precision-engineered, high-pressure robotic water cannons to autonomously and immediately neutralise ignition threats in high-risk industrial environments before they become catastrophic fires.

THERMINATOR®'s sophisticated AI-powered thermal detection and robotic water cannon intelligence enable the system to continuously monitor and analyse thermal patterns across the facility. When an ignition hot spot is detected and confirmed, Magnum's patented, self-operating, high-pressure water cannon immediately activates, extinguishing the threat with surgical precision during its pre-combustion phase, thereby eliminating the risk of ignition.

A PERFECT STORM

Waste Industry Reality

Industrial fires: from occasional to constant

- Over 40 million tonnes of material processed each year
- Recycled tonnage increasing 3.1% annually
- More than double Australia's average population growth
- Circular economy goal of 80% recovery by 2030
- Over 140 new & upgraded recycling facilities in the pipeline
- Fire incidents increasing 25% annually
- Lithium-ion battery consumption growing exponentially
- 12,000 battery-related fires per year across the waste industry
- 30 fires per day nationally
- 5.5 fires per facility per year
- \$100,000,000's cost to industry

*Data provided by DCCEEW

“We are facing an unprecedented industry-wide crisis.”



FIRE RISK HAS CHANGED FUNDAMENTALLY

Thermal Runaway Changes Fire Behaviour

Industrial fire - the new norm:

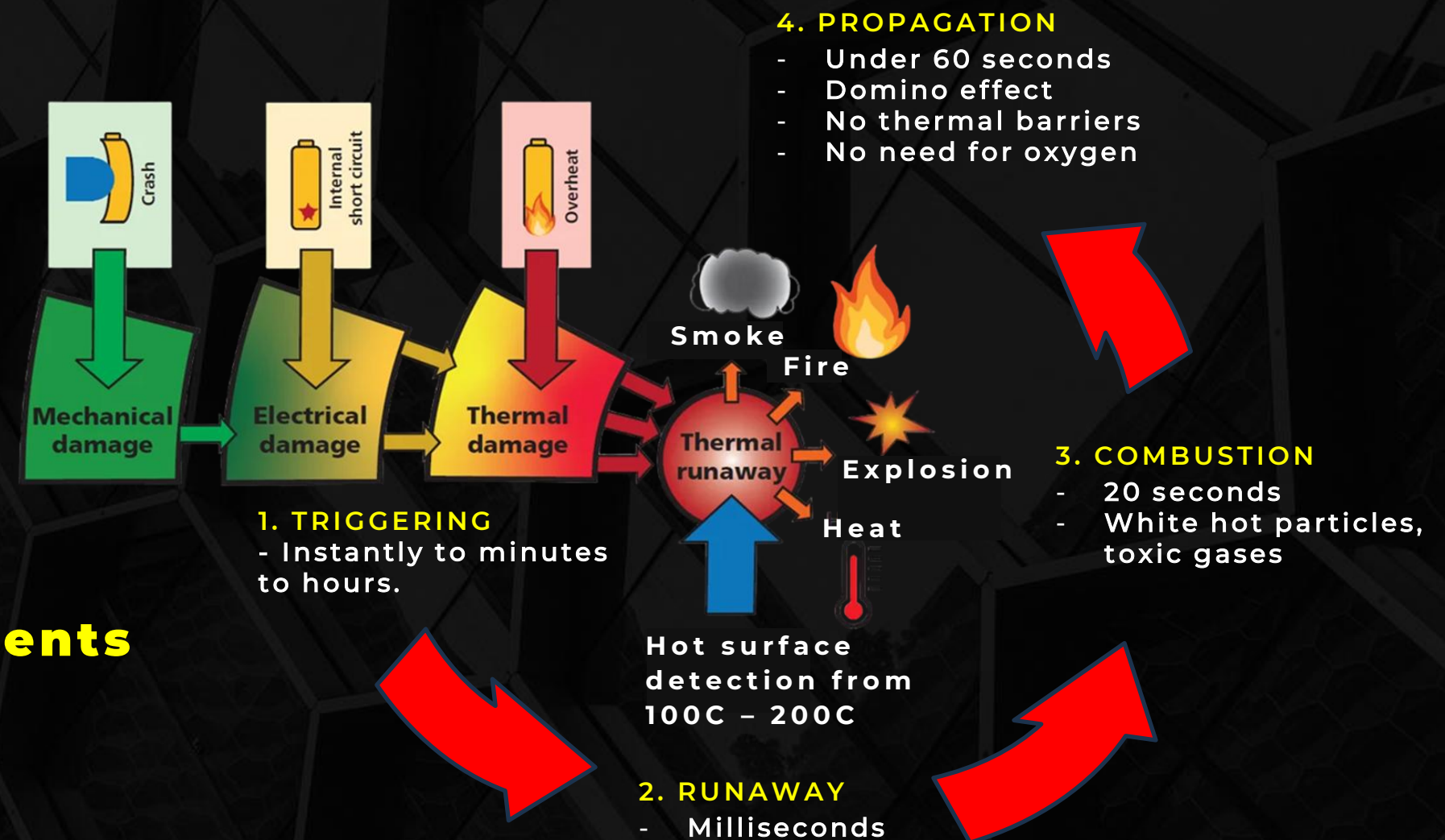
Ignition sources in every waste stream

Invisible, subsurface heat accumulation

Self-sustaining chain reactions

Reignites after suppression

“Spray & Stop” systems cannot control events



Industrial fire is systemic, continuous & increasing in frequency & severity

DETECTION EXISTS – CONTROL DOES NOT

The Industry Solved The Wrong Problem

The industry has invested heavily in detection and suppression, but fires continue to escalate.

Detection identifies risk

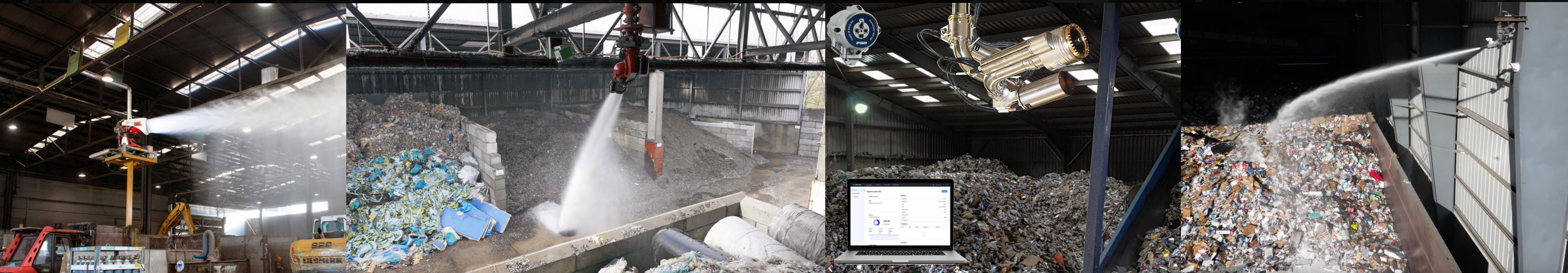
Suppression applies response

Neither guarantees control



Fires are not extinguished

Reignition remains inevitable



CURRENT FIRE SYSTEMS ARE OPEN LOOP

No Verification = No Control.

Operating without feedback.

Cannot confirm whether fire has been extinguished.

Open-Loop Design Flaws:

- No thermal reassessment after suppression
- No automated re-engagement
- No confirmation of extinguishment

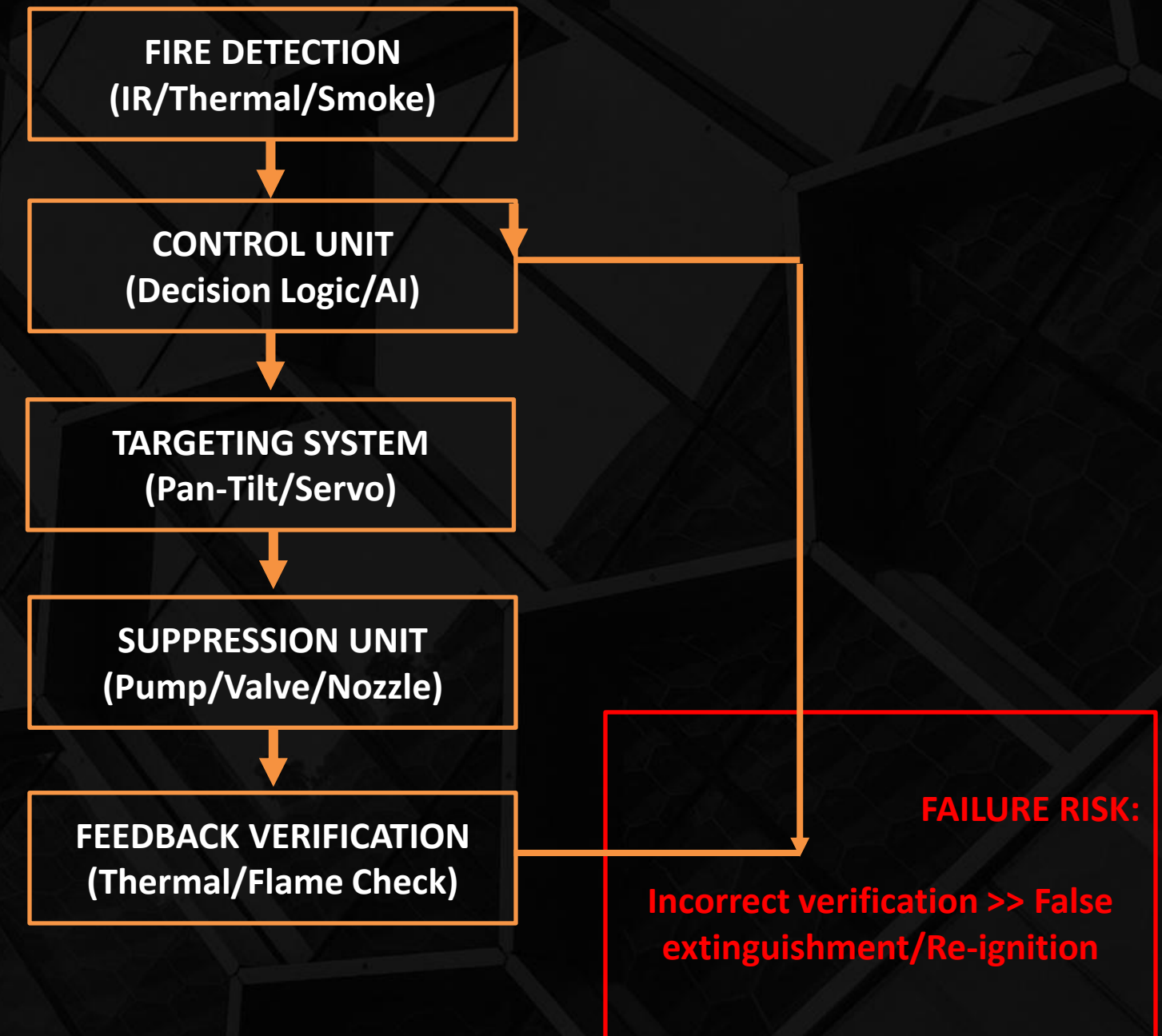
Outcome:

- Fire assumed to be extinguished – but not proven.

Engineering Gap:

Fire systems stop when suppression ends – not when risk is eliminated.

Autonomous Robotic Fire Suppression System



MAGNUM - DEFINING A NEW CATEGORY

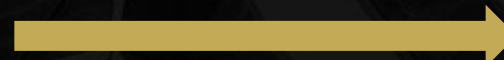
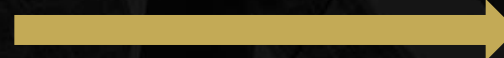
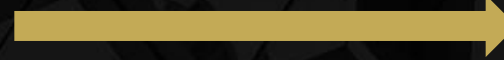
**“Autonomous Closed-Loop Fire Suppression System
– With Zero Ongoing Monitoring Costs”**

PARADIGM SHIFT

Detection

Reaction

Assumption



Control

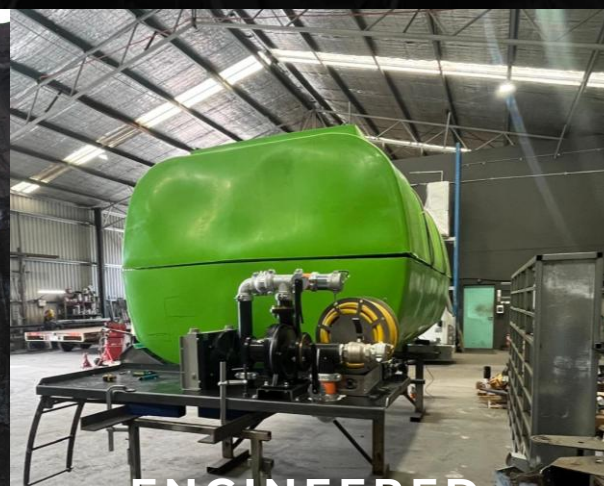
Management

Verification

Magnum has been integrating first-of-kind technologies into its industrial systems since 2016



RF SPRAY CANNONS



ENGINEERED
POLYMER TANKS



RF ROBOTICS



IN-CAB AI CONTROL



RF WATER CONTROL

THERMINATOR® - CLOSING THE LOOP

Closed-Loop Control Architecture – Continuous Until Safe

THERMINATOR® continuously and autonomously monitors and responds until thermal threat is proven extinguished

Thermal monitoring every second

AI-driven decision-making

Precision detection & suppression within 15 seconds

Reassessment every 10 seconds

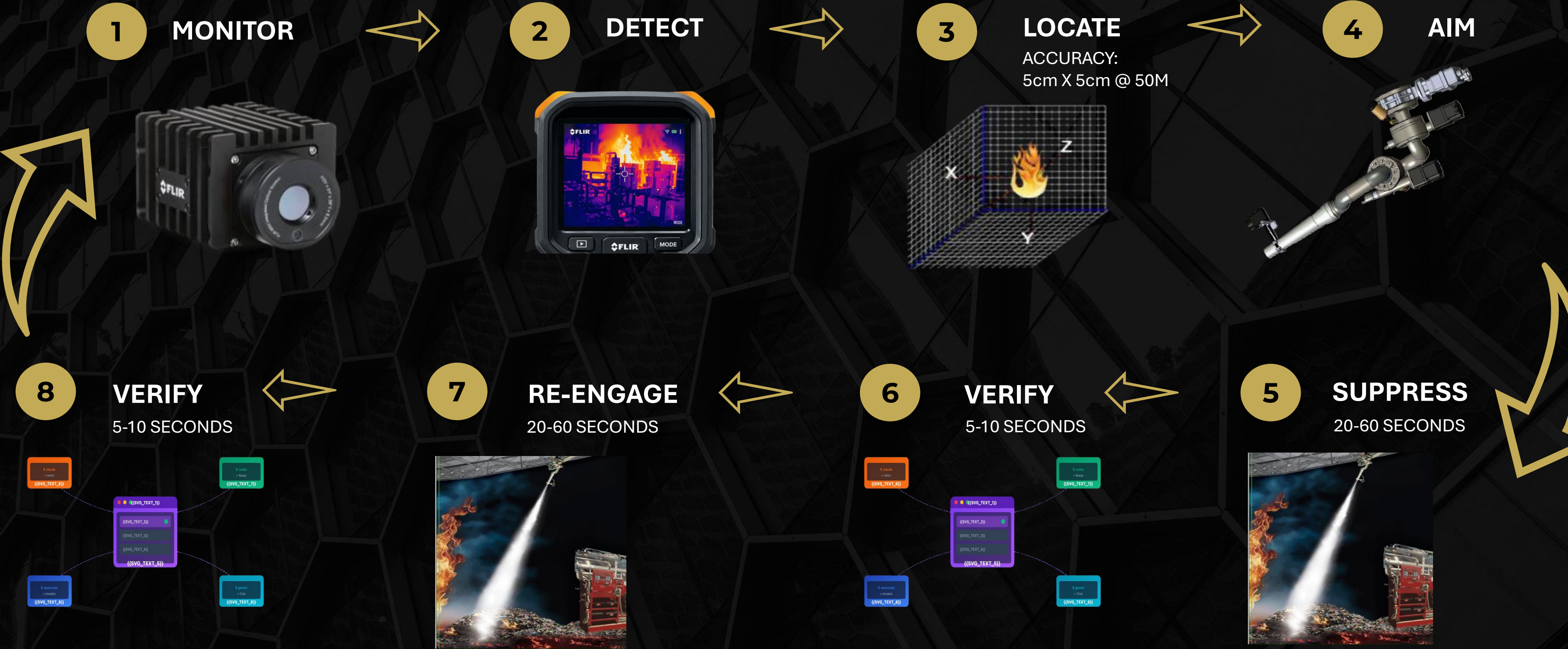
Autonomous re-engagement

Does not stop until thermal threat is confirmed extinguished



CLOSED-LOOP. AUTONOMOUS. ON GUARD 24/7

THERMINATOR® FIRE CONTROL



REAL-WORLD VALIDATION

THERMINATOR® - Proven Engineering Performance

Magnum partnered with industry to trial THERMINATOR® under real-world conditions

Over 2+ years of continuous operation across multiple sites (ongoing)

VERIFIED RESULTS

ZERO recorded system failures

ZERO human intervention required

ZERO mechanical failures

5 confirmed extinguishments before ignition incidents

100% elimination of reignition cycles

70% reduction in water use

INDUSTRY LEADERS CLOSING THE LOOP

THERMINATOR® has moved beyond trials

Leading operators already committing to THERMINATOR® systems



FROM UNCERTAINTY TO CONTROL

THERMINATOR® Deployment Makes Fire Risk Insurable

INSURERS REQUIRE

**Proven
performance**

**Demonstrable
control capability**

**Verified risk
reduction**

THERMINATOR® PROVIDES

- Continuous detection
- Autonomous response
- Integrated systems
- Verified extinguishment
- Continuous monitoring data
- Closed-loop traceability
- Verified extinguishment records
- Reduced loss severity
- Improved insurer confidence

INSURABILITY TRANSFORMATION

UNCERTAIN



MEASURABLE

UNCONTROLLED



MANAGED

UNINSURABLE



INSURABLE

THERMINATOR® transforms fire from uncertain risk into a measurable system

FINANCIAL CONTROL OF RISK

THERMINATOR® Delivers Measurable ROI

Fire risk can now be managed as a controllable financial variable

VERIFIED RESULTS FROM PILOT & CLIENTS

Capital investment realised within 12 months for complete system

One client paid for system from allocated mandatory labour budget

No hidden fees or ongoing monitoring costs

Precision targeting = minimised collateral water damage

Loss reduction: 50-80%

Insurance improvement: 10-30%

*Data provided by NWRA, RRS, AXA XL, WASTE 360

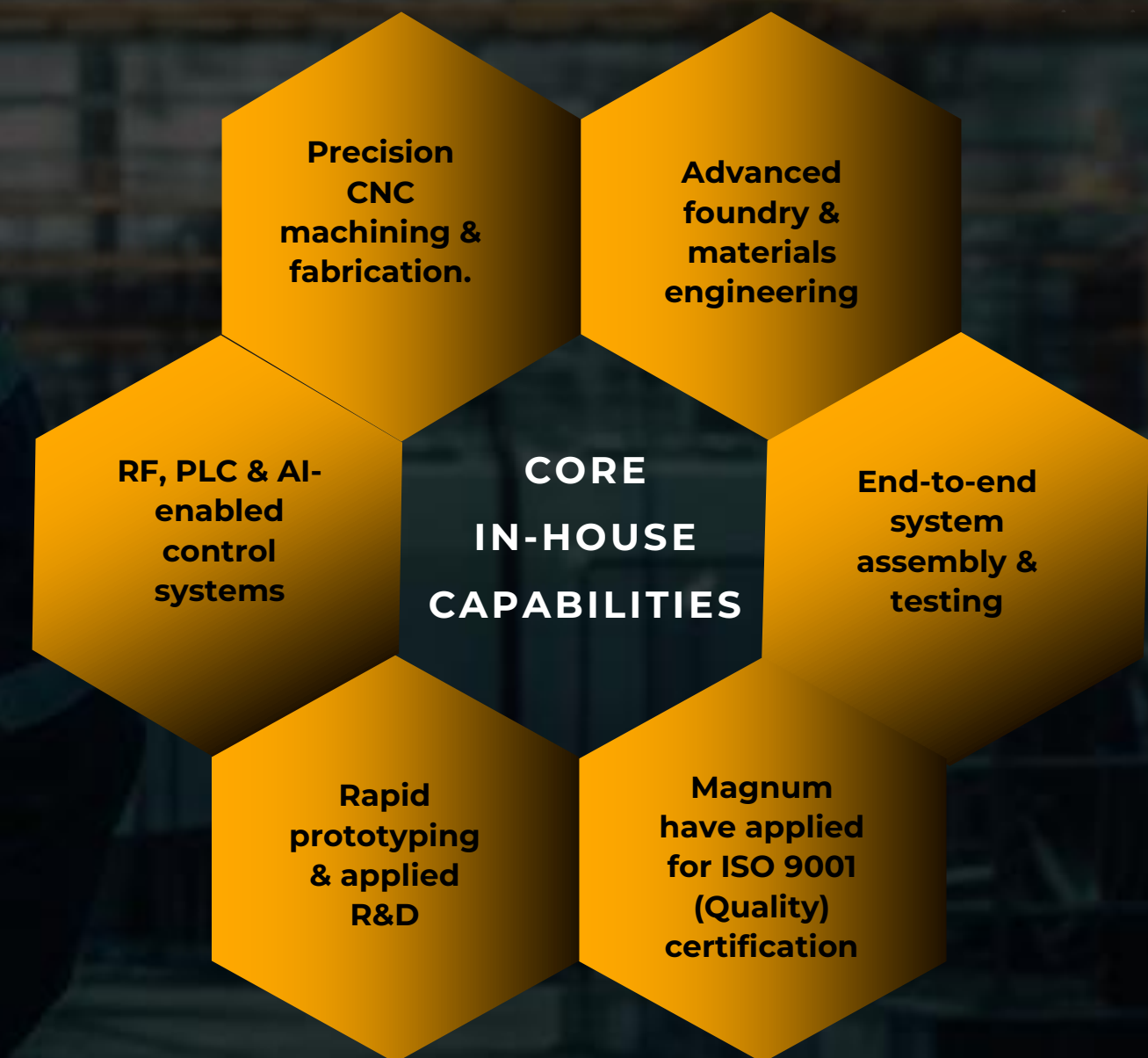
PUSHING THE PERFORMANCE FRONTIER



Integrated Engineering - The MAGNUM Advantage



- 55 years of continuous innovation
- Not simply manufacturing components
- Own the entire solution lifecycle
- Unmatched control over quality, innovation & delivery
- Eliminates multi-vendor risk & interface failure points
- Design, build & commission operational ecosystems for the world's most demanding environments



Our Integrated Engineering delivers infrastructure-ready systems, not off-the-shelf products.

TURN-KEY MANAGEMENT SOLUTIONS



MINING & RESOURCES

- Dust suppression & haul road management
- Water carts, tanker fit-outs, pumping stations
- Autonomous fire protection
- Wash-down & contamination
- Mine-spec engineered systems

AGRICULTURE & FOOD

- High-efficiency water dispersal & conservation
- Spray control, pumping & automated distribution
- Infrastructure engineered solutions

CONSTRUCTION

- Site dust control
- Heavy equipment wash-down
- Water delivery systems
- Rapid-deploy, integrated solutions



FIRE & EMERGENCY

- Fire-fighting water trucks & fixed installations
- AI-enabled early suppression systems
- Autonomous fire protection
- Infrastructure protection for high-risk assets

WASTE/RECYCLING

- Odour & dust mitigation systems
- Automated water cannons
- Programmable environmental compliance systems

PUSHING THE PERFORMANCE FRONTIER



MAGNUM

Disruptive engineering empowering partners & clients