

# THERMAL X<sup>®</sup>R

Powered by

## GMG

GRAPHENE



### SUPERIOR PROTECTION

Corrosion Resistant



### SUPERIOR HEAT TRANSFER

Graphene Thermal Conductivity



### ENERGY SAVINGS

Up To 50% Electricity Cost Savings



### NANOTECHNOLOGY

150m<sup>2</sup>/g Surface Area & Water Resistant



Global Data Center Industry  
Innovation Challenge Winner



Product  
Excellence Award  
- HVAC



Australian Air Conditioning  
Industry Product of the Year

## ENERGY SAVINGS

## ENERGY STORAGE SOLUTIONS

ASTM TESTED - 20,000+ HOURS

## WHAT IS THERMAL-XR®

**THERMAL-XR®**, powered by GMG Graphene technology, offers an innovative solution for boosting heat transfer and enhancing the thermal efficiency of heat exchangers. This technology also increases resistance to corrosion, having successfully passed rigorous salt sea spray testing to over **20,000 hours**. It is designed for use on aluminium and copper fins and tubes in air-cooled heat exchange systems.

## WHY CHOOSE THERMAL-XR®

**THERMAL-XR®** has been independently performance verified, implemented globally, and exceeds various ASTM industry standards. See proven results and case studies at [graphenemg.com](http://graphenemg.com) and on our LinkedIn page.

### ! ENVIRONMENTAL IMPACT ON ASSETS

- Inland degradation **4-5%** per year
- Sea coast degradation up to **10 times** faster\*
- Asset life shortened up to **50%\*\***

\* <https://sciencing.com/effects-saltwater-metals-8632636.html>

\*\* U.S. Army Corps of Engineers, Report on Project F10-AR01 (2015)

## INDUSTRY APPLICATIONS

- HVAC-R
- DATA CENTRES
- OIL & GAS UPSTREAM
- ENERGY, POWER, & HYDROGEN PRODUCES
- CHEMICAL & MINING INDUSTRY
- LNG & GAS PLANTS
- PUBLIC TRANSPORTATION
- REFINERIES & PETROCHEMICAL PLANTS

## KEY BENEFITS



### CORROSION PROTECTION:

**THERMAL-XR®** offer a protective layer that combats degradation caused by corrosion. This ensures equipment remains functional and improves the efficiency over the life of the unit. This is particularly important in harsh or coastal environments.



### ENERGY SAVINGS:

**THERMAL-XR®** is engineered to improve heat transfer resulting in meaningful electricity savings over the life of the unit up to 50%.



### SIMPLE APPLICATION:

**THERMAL-XR®** does not require any specialised tooling. For installation, **THERMAL-XR®** can be applied directly by a certified installer onsite or in the field.



## SIMPLE APPLICATION PROCESS

- No proprietary tooling required (spray application)
- Six monthly maintenance – clean using low-pressure water
- Field and factory application
- Installed using spray applicator, flow coating or dipping



**THERMAL-XR® exceeds 20,000 hours**  
of salt sea spray testing (ASTM B117)



# ENERGY SAVING THROUGH SUPERIOR HEAT TRANSFER

- **THERMAL-XR®** doubles the heat transfer rate at 60°C.
- Improved efficiency through faster heat transfer reduces energy use and potential emissions.
- Energy savings can be up to 50% with a lower carbon footprint.

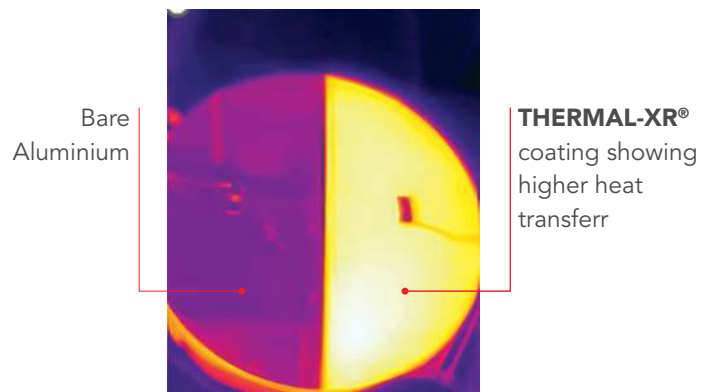
## THERMAL-XR® - UNIVERSITY VERIFIED TEST RESULTS

Kiln Test Rig



Kiln with Aluminium Plates

Thermal Imagery



Lab test shows **THERMAL-XR®** coating delivers significantly higher heat transfer compared to bare aluminium - proof of superior thermal conductivity in action.

## HOW DOES IT WORK?

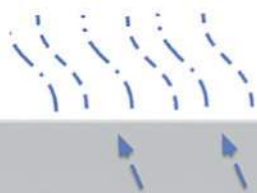
**THERMAL-XR®** adds thermal radiation to forced and natural convection

**16**  
W/m<sup>2</sup>K  
**FORCED CONVECTION\***



CONDUCTION

**2**  
W/m<sup>2</sup>K  
**NATURAL CONVECTION**



**8**  
W/m<sup>2</sup>K  
**THERMAL RADIATION**



**THERMAL-XR®**  
ALUMINIUM

**1**  
W/m<sup>2</sup>K  
**THERMAL RADIATION**



\* at 2m/s air speed

# SUPERIOR HEAT TRANSFER AND PROTECTION

▶ TESTS	▶ INFORMATION	▶ STANDARDS	▶ PERFORMANCE
SALT SPRAY	Marine Air Corrosion Resistance	ASTM B117	20,000+ h
SALT SPRAY ACIDIC		ASTM G85 A1	Exceeds 3000 h no blisters, flaking, loss of adhesion or rust
SALT/SO2 SPRAY TESTING		ASTM G85-09: Annex 4	Exceeds 720 Hours – no corrosion or defects
WATER IMMERSION	500 h	ASTM D870	No blisters, flaking, cracks, rust or softening of coating
UV RESISTANCE	1000 h	ASTM D4587	No fading, blistering, flaking or loss of adhesion
ADHESION	Cross Hatch	ASTM D3359-88 53151	Level 0 European 5B, B-A
FLEXIBILITY		ASTM D522	No cracking, flaking or loss of adhesion
ANTI-FUNGAL		ASTM G21	After 28 days growth is greatly reduced – Score 2
OPERATIONAL TOLERANCE	Dependent on application method		-10°C to 150°C (14°F to 302°F) short periods max: 300°C ( 572°F)
VISCOSITY			50-80 secs (Zhan type cup #2)
pH OF THERMAL-XR ENHANCE			8 -10
pH TOLERANCE OF THERMAL-XR COATING			1-12
VOLUME SOLIDS			25%+2% vol/wt
TOUCH DRY			1 hour at 25°C (77°F)
COLOUR	Black (from GMG Graphene enhancement)		
GLOSS LEVEL	The product ranges from matte to semi-gloss based on curing conditions		
EMISSIVITY			0.95 (out of 1.0)
TYPICAL THICKNESS	DFT 8-20 microns dry film thickness equivalent to WFT 50-75 microns wet film thickness.		
THEORETICAL COVERAGE	10 m <sup>2</sup> /L at 15 microns DFT and stated volume solids		
TYPICAL COIL FIN COVERAGE	2 sqm/L based 5 cm to 7.5 cm thick coil		
APPLICATION TEMPERATURE	Apply at above 5°C (41°F) and below 40°C (104°F) and +3°C (37.4°F) above dew point (below 80% relative humidity)		
APPLICATION METHOD	Spray applicator, flow coat, dipping		
<b>WARRANTY</b>	5-year limited warranty – contact your GMG account manager for warranty service and solutions		



GMG is a clean-technology focused company which offers energy-saving products and solutions, as well as energy storage products, enabled by Graphene manufactured in-house via a proprietary production process.

GMG developed and proved its proprietary production process to produce GMG Graphene. This process produces high quality, low input cost, scalable, tuneable and low contaminant Graphene suitable for use in clean-technology applications. GMG's focus has been developing applications for **ENERGY SAVING AND ENERGY STORAGE**

CLICK TO LEARN MORE



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