



BOYD
TRUSTED INNOVATION

Engineered Materials – **SOLIMIDE® Foam**

High-performance Thermal and Acoustic Insulation

Boyd Confidential

Boyd Facilities – North America EM

Facility	Size	Certification	Solutions	Capabilities	
Pleasanton, CA	NA	NA	Corporate functions		
Boca Raton, FL					
Allenton, WI	8,800 m ²	ISO 9001	Die Cast Solutions	- High Pressure Die Casting - Machining and Metal Joining	
Beaverton, OR	3,990 m ²	ISO 9001 AS9100 ISO 13485	- Injection Molded and Decorated Components - Elastomer Keypads - Plastic Bezels and Assemblies	- Plastic Decoration (Screen and Pad Printing, Laser Etching, Hot Stamping, Spray Painting) - Heat Staking	- Injection and Compression Molding - In-mold Decoration (IMD) - Robotic Assembly - Plastic Tooling and Machining
Chatsworth, CA	3,250 m ²	ISO 9001 ISO 13485	- Advanced Wound Care - Medical Wearables	Clean Room Manufacturing	
Elkhart, IN	12,100 m ²	ISO 9001	Extruded Plastic Seals, Continuous Length Seals, Slide-out Seals	- Multi-durometer Plastic Extrusion Lines - Finishing Machining and Assembly	
Gaffney, SC	12,100 m ²	ISO 9001 IATF 16949 ISO 14001	- Heavy Duty Wear Protection - Airflow Management and Heavy-duty Aerodynamic Components - Vibration Absorption and Mechanical Damping - Environmental Sealing and Gaskets	- Flat Bed Die Cutting - Laminating and Slitting - Heavy Duty Stapling / Stitching	
Grand Rapids, MI	9,300 m ²	ISO 9001 IATF 16949	- Bonding Laminates, Precision Converting of Adhesive Systems - Smart Display Laminates and Medical Wearable Assembly - Thermal Interface Materials and Graphite - O-Rings	- Rotary Die Cutting and Cleanroom Manufacturing - Laminating and Slitting - Knife Plotter	
Magnolia, AR	4,200 m ²	-	Full Mass Production of SOLIMIDE® Foams in Raw Format		
Monroe, NC	7,890 m ²	ISO 9001 IATF 16949	- Metal Nameplates and Logos - Decorative Metal Trims and Accents - Sill Plates and Key Fob Jewels	- Digital Printing - Pad Printing - Progressive Die-cutting - Embossing and Debossing	- Diamond Carving - Doming - Roll Coating

Boyd Facilities - Europe

Facility	Size	Certification	Solutions		Capabilities	
Ashington, UK	2,800 m ²	ISO 14001 ISO 9001 OHSAS	- Advanced Liquid Cold Plates - Heat Pipes - Thermosiphons - Vapor Chambers	3D Vapor Chambers - Encapsulated Graphite Solutions - Heat Pipe Assemblies	- CNC Machining - Vacuum Brazing - Heat Pipe and Vapor Chambers – Filling and Sealing - K-Core	- Design and Engineering - Advanced Thermal Testing - Clean Room Manufacturing - Prototyping - Metal Heat Treating
Bologna, Italy	4,800 m ² + 2,000 m ²	IATF 16949 ISO 9001	- Heat Sinks - Extruded, Stamped, Advanced Fin Types - Liquid Cold Plates - Heat Pipe Assemblies - Chassis		- CNC Machining - Finishing - Metal Joining and Heat Treating - Cut to Length Extrusion	- Design and Engineering - Advanced Thermal Testing - Prototyping - CAB Brazing
Nivelles, Belgium	9,500 m ²	ISO 9001	- Insulating (SOLIMIDE) Solutions - Elastomers and Thermoplastics	- Gaskets, Seals, Dampers - Air Blockers and Gap Fillers - Tapes, Films, and Adhesives	- CNC Machining (of Plastics and Composites) - Molding and Extrusion	- Thermoforming (of Foams) - Cutting and Stamping - Bonding and Assembly - Skiving
Gliwice, Poland	12,600 m ²	IATF 16949 ISO 9001 ISO 14001	- Liquid Cold Plates - Chillers - Gaskets and Seals - Shields and TIMs	- Integrated Liquid Systems - Machined Heat Sinks - Thermosiphons	- High Speed Flatbed Die-Cutting 5 Chamber Cab Brazing - CNC Machining	- Design Engineering - Sandblasting - Rapid Prototyping - Metal Heat Treating - Chiller assembly
Stochov, Czech Republic	3,500 m ²	ISO 9001	Silicone Solutions		- Molding and Compression of Silicone - Assembly	
Syke, Germany	6,588 m ²	IATF 16949 ISO 13485 ISO 14001 ISO 9001	- Adhesives - Pads - Gaskets and seals - Shields - TIMs	- Lens Protect and Adhesives - Display Films - Insulators - Speaker Mesh and Felt	- Rotary Die Cutting - Flat Bed Die Cutting - Kiss Cutting - Laminating - Ultra-sonic Welding	- Slitting - Eccentric Pressing - Laser Prototyping - Clean Room Manufacturing
Weiler-Simmerberg, Germany	7,100 m ²	ISO 13485 ISO 9001	- Silicone Tubes, Cords, and Profiles - Silicone O-Rings and Seals - Silicone Molded Parts		- Silicone Extrusion - Injection and Compression Molding - Rapid Prototyping - Assembly	

Insulation and Shielding

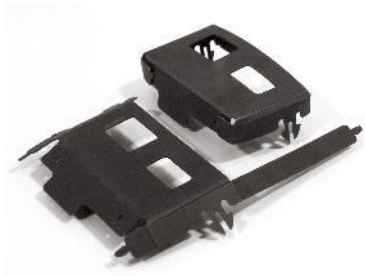
Acoustic Insulation



Thermal Insulation & Shielding



Electrical Insulation



EMI/ RFI Management



SOLIMIDE® Foam Overview

- Polyimide-based thermal and acoustic insulating foam
- Open-cell, low density (5 to 9 kg/m³) foam
- Foam produced at Boyd's Magnolia, AR facility



Benefits of SOLIMIDE® Insulating Foam

- Superior fire resistance
- FAR 25.856(a) / UL94-V0 compliant
- Low smoke / Non-toxic when exposed to flame
- No outgassing / Siloxane
- High chemical resistance
- Easy installation
- Wide operating temperature range
- Dimensional stability throughout temperature range
- Remains flexible at cryogenic temperatures
- Lightweight
- Hydrolytically stable
- Does not support microbial growth
- Works well with most typical adhesives

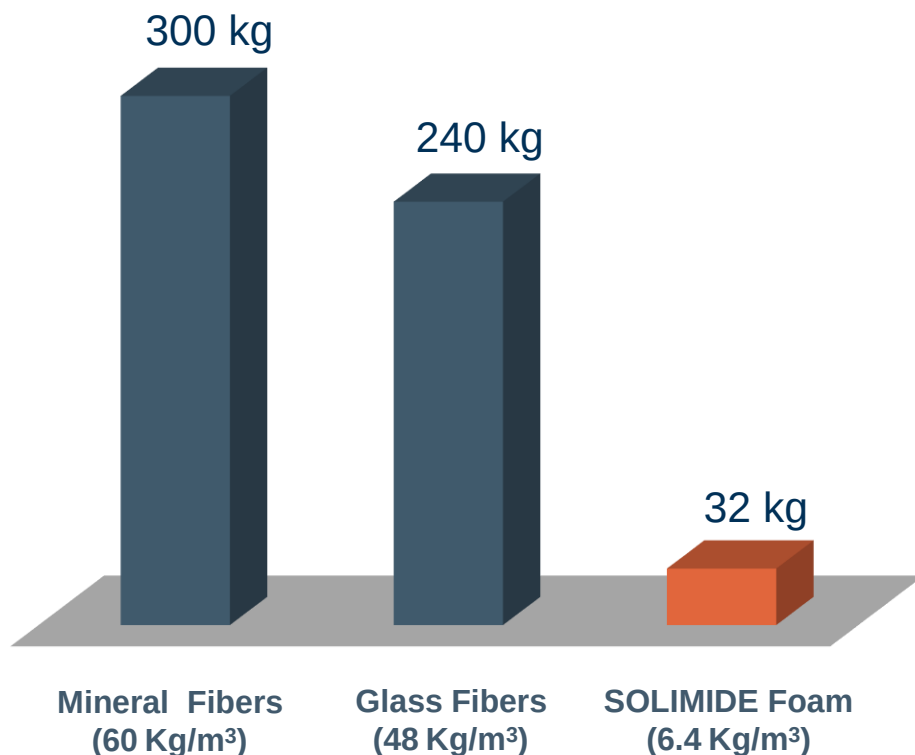
SOLIMIDE® Foam Technical Details

- The “continuous use” temperature range of Solimide is uniquely wide:
 - From below -325°F(-200°C) up to +572°F (+300° C)
 - Most foam/sponge materials only operate in portions of this broad temperature band
 - Exceeds FAR 25.856 flammability specifications
- Highest-temperature SOLIMIDE® foam, HT-340, is rated to UL94 V-0 at 0.12” (3mm) or thicker, and UL94 5V at 6mm and above
- The standard densities (by grade) range from 0.34 to 0.5 lbs/ft³ (5.4 kg/m³ and 8 kg/m³)
 - A block of TA-301 the size of a typical passenger car weighs about 150lbs. (68 to 100 kg)

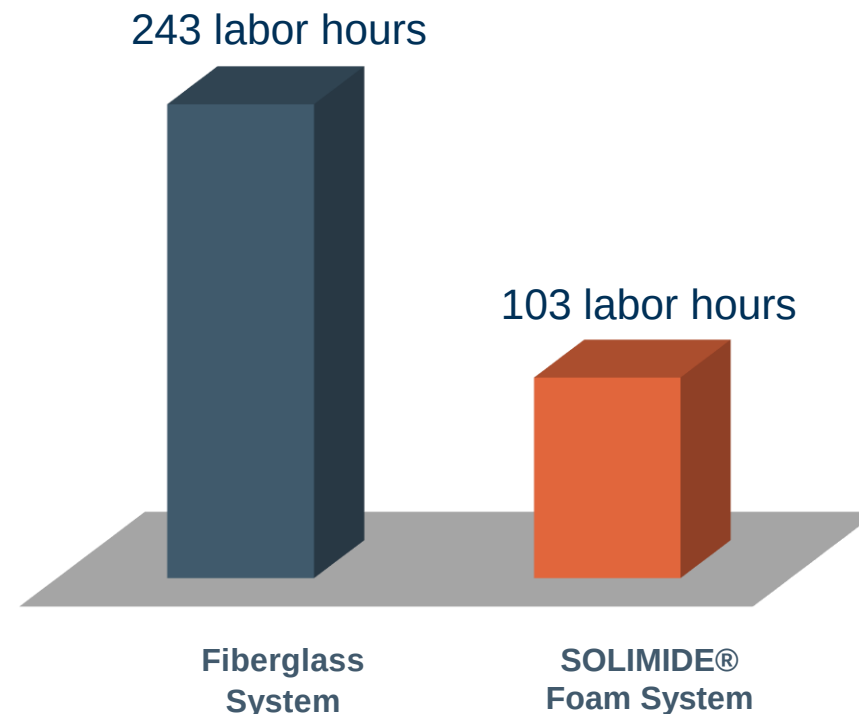


Weight Savings and Assembly Efficiency

Self-supporting and semi-rigid with no particulate fibers, SOLIMIDE® does not require special protective gear for installers, resulting in weight and time savings



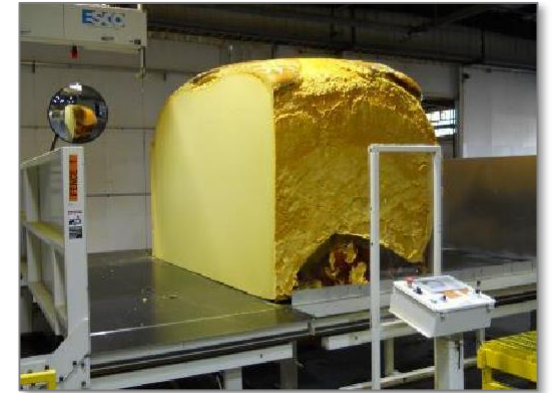
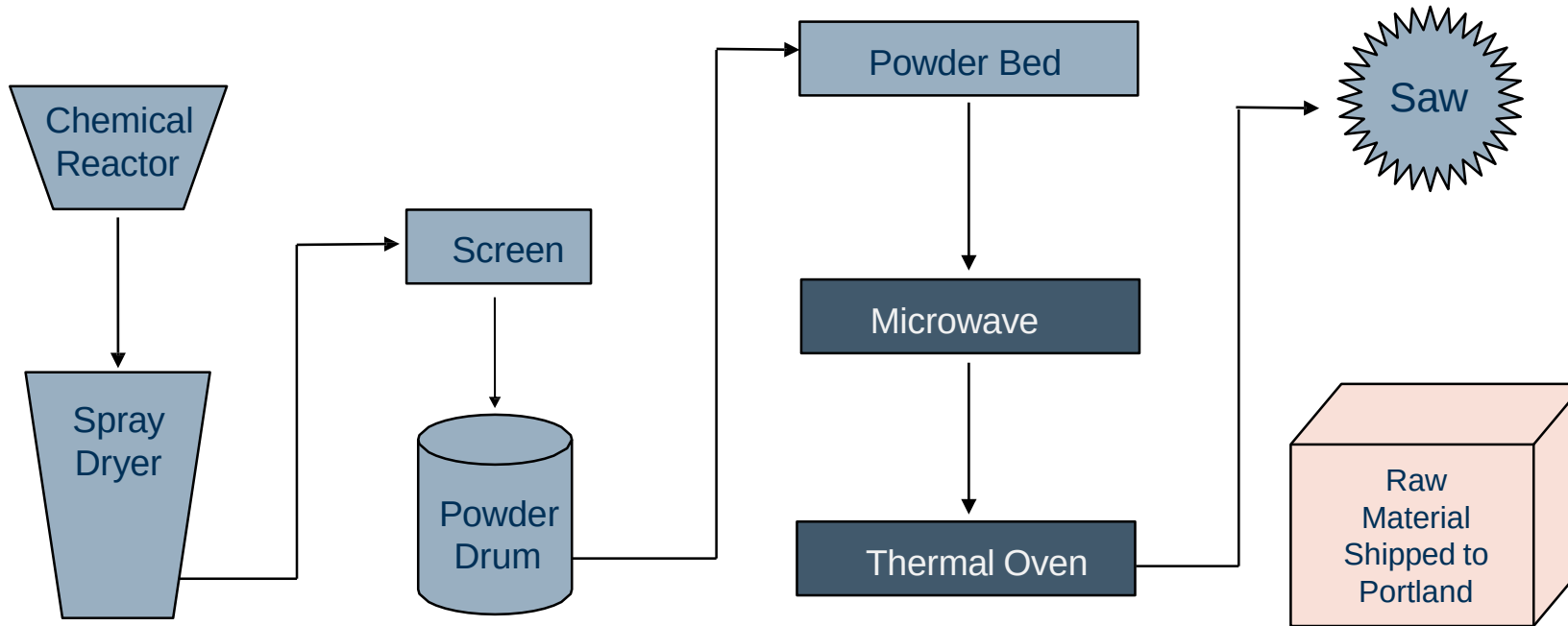
Installation of 100m² insulation at 50 mm thickness creates **86% weight savings** with SOLIMIDE® compared to traditional insulation, enabling greater fuel efficiency & payload



140 labor hours saved per 100m² installed, **>50% labor savings** to the OEM, translating to greater production throughput, efficiency, cost savings, safety and employee satisfaction

How is SOLIMIDE® Foam made?

- Boyd is the only manufacturer and converter for this proprietary foam
- Manufactured in Boyd's Magnolia facility in Arkansas
- Components customized and converted in Boyd's Portland facility in Oregon



Trimmed "Bun" in Magnolia, AR



Converted Geometries in Portland, OR

Popular Converting Methods

- Waterjet for intricate/thick sheets
- CNC machined
- Die-cut under ½" thickness
- Saw/wire cut
- Flame treating
- Skinned using hot platen
- Bonds well with common adhesives for lamination



SOLIMIDE® Foam Grades

TA-301	• General purpose grade • Medium density - 6.4 kg/m³ (0.40lb/ft³) • Marine, rail, electronics/communications equipment and other general industrial applications • Maximum continuous use temperature is 200°C (392°F)
HT-340	• High-temperature grade • “Orange” color, medium density - 6.4 kg/m³ (0.40 lb/ft³) • Commercial marine, appliance, engine proximity, battery, and other high temperature applications • Maximum continuous use temperature is 300°C (572°F)
CC-306	• High closed-cell content for below waterline/submersible applications • Highest density - 8.0 kg/m³ (0.50lb/ft³) • Designed for submarine, specific maritime applications • Maximum continuous use temperature is 200°C (392°F)
AC-530	• Low-density aircraft grade • Lowest density - 5.7 kg/m³ (0.36 lb/ft³) • Aircraft, space, cryogenic applications • Maximum continuous use temperature is 200°C (392°F)
AC-550	• High-density aircraft grade • High density - 7.1 kg/m³ (0.44 lb/ft³) • Aircraft, space applications • Maximum continuous use temperature is 200°C (392°F)



HT-340 SOLIMIDE Foam



AC-530 SOLIMIDE Foam

Popular Available Formats

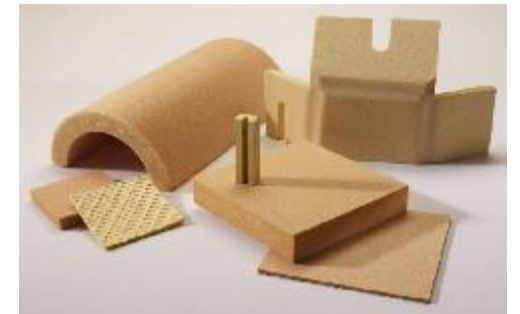
- Sheets or panels
- Profile cut shapes
- Die cut parts
- Laminated with facings and/or coated
- Available with added films, adhesives and release liners
- Faced systems are recommended for applications in moist environments, accept protective surface treatments
- Thickness from 5mm, Sizes to 1.2m x 2.4m
- Inner diameter cuts from 6mm



Densified SOLIMIDE® Foam

Densified SOLIMIDE® Foam properties vary depending upon the level of densification and can be tailored to meet specific requirements

- Densification is a customizable physical characteristic which can be virtually any density higher than the original for all grades of SOLIMIDE® foam
- Densification can be used to “skin” foam surface for improved moisture resistance and surface durability
- Typical densities in production up to 9X the standard density of stock SOLIMIDE® foam
- Increased density yields improved mechanical stability that allows:
 - Ultra-thin sheets, as thin as 0.020” (0.5mm)
 - 3D CNC finished parts
 - Embossing for complicated topography
- Densification can “tune” thermal and acoustic performance to specific conductivities/frequencies



Clean Solutions for Modern Day Challenges

As industries, service providers and manufacturers restart post-COVID, they are introducing new precautions and infrastructure to better protect their customers and employees.

SOLIMIDE® **does not support microbial growth**, is hydrolytically stable & does not retain liquid

- Although not anti-microbial, SOLIMIDE® will not grow microorganisms like bacteria, viruses & fungi on its own. *(If microbes are introduced through something else, they will still grow, but the foam will not foster microbes itself.)*
- It can withstand exposure to & will not be degraded by water & other cleaning solutions
- SOLIMIDE® has tested resistant to: Hydraulic fluid, diesel, jet fuel and additional solvents
- SOLIMIDE® is an ideal “set it and forget it” insulating solution helping to:
 - Create a safer environment for users
 - If the foam is exposed to liquids during decontamination processes, it will not degrade, retain liquid or grow mold – negating the need to replace insulation
 - Promote long term efficiency heavy machinery
 - Resistant to deterioration over time compared to fiberglass in an environment with shock or vibration

Industry Applications

Traditional SOLIMIDE® Aviation Design Project

Interior thermal-acoustic blankets/bilge fire-barrier

- Dimensional stability helps keep other materials from slumping
- Block subzero cold outside the aircraft
- Acoustic properties minimize engine/slipstream noise
- Low mass allows more passengers to be carried.
- Fire resistant, low smoke, and non-toxic nature buy time for passenger exit in a fire event

Environmental Control Systems (ECS) duct insulation:

- Air from the cabin vents on every Airbus aircraft moves through ducts insulated with Solimide
- Prevents internal airframe ice (therefore weight) build-up
- Quiets high-velocity air noise

Ceiling insulators:

- Solimide bonded to solid fiberglass panels insulate passengers from noise and cold.
- The combination protects the foam and holds back, at least temporarily, flame in a cargo fire.

Traditional SOLIMIDE® Aviation Design Project

Objective: SOLIMIDE® Foams replaces fiberglass as bulkhead insulation

Challenge:

Commercial aviation OEM was challenged with vapor condensing within cabin walls, collating in existing fiberglass insulation which caused the insulation to deteriorate and for microbial / fungal (mold) to grow and drip onto passengers.

Results:

Replace with SOLIMIDE® Foams whose open-cell structure withstands exposure to water with zero impact and does not support microbial growth, meaning the new insulation solution lasted longer and maintained a pure breathing environment.



Boyd helped this OEM decrease maintenance costs and downtime while improving passenger health and safety.

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