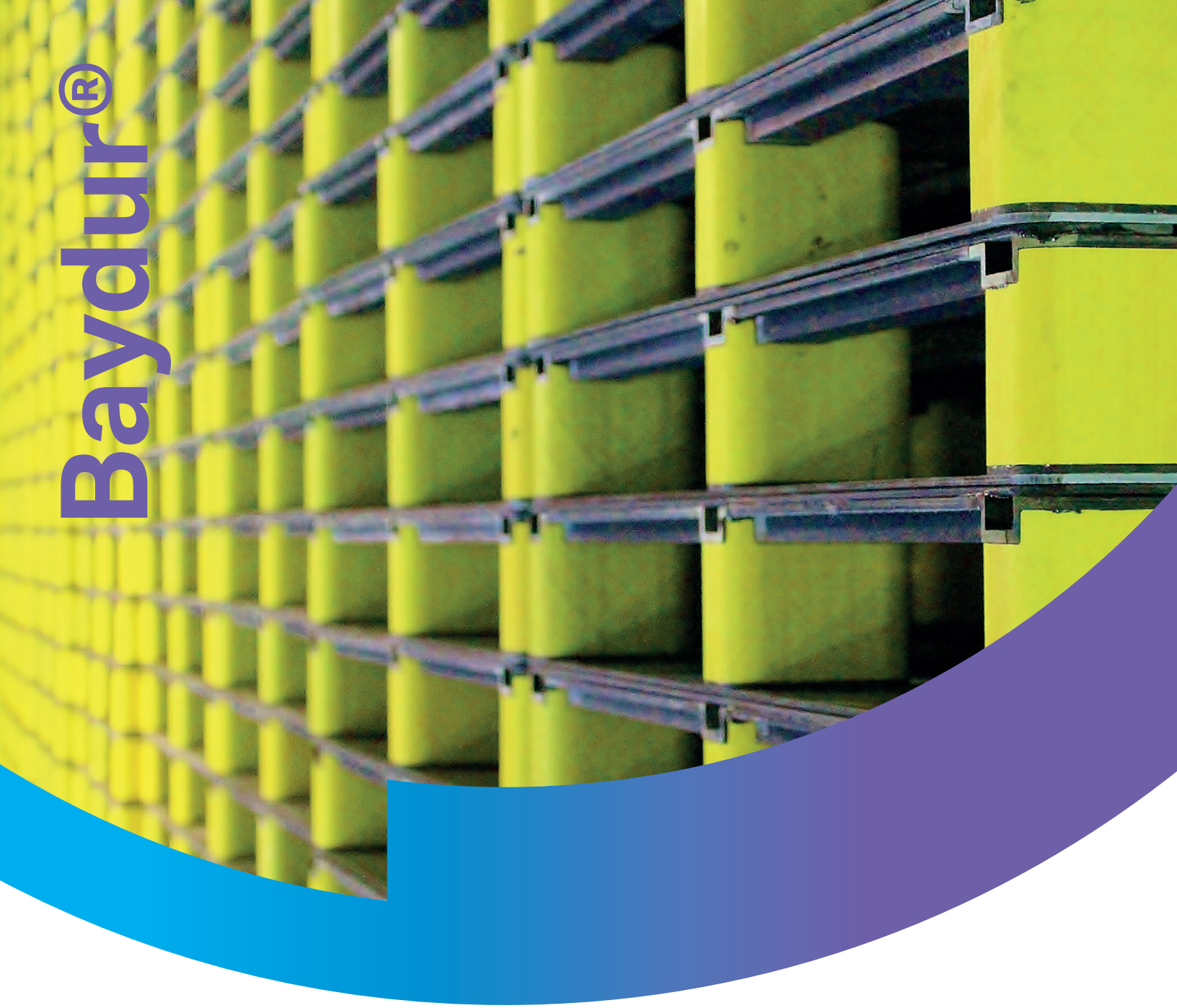
Baydur®



Modernizing material handling

Composite pallet delivers supply chain innovation

covestro

Forget everything you knew about material handling.

A new approach to pallet design, fabrication and management is transforming how companies move their products around the world. This approach, developed by RM2, is not merely different, it is better … enabling companies to improve the quality in their supply chain, control costs and achieve their sustainability goals.

This innovative, multi-faceted approach begins with polyurethane resin from Covestro LLC. This resin is pultruded to form BLOCKPal™, a lightweight composite pallet that resolves many of the issues the material handling industry faces related to traditional wood or polymer block pallets.

Material/Technology:

Baydur PUL 2500 pultruded, two-component polyurethane resin

Application:

Composite pallet for material handling

High-Impact Engineering

Specially designed for use in pultrusion, Covestro's Baydur® PUL 2500 resin is a two-component polyurethane system that offers excellent properties, including greater strength, higher toughness and higher impact resistance than what can be achieved with traditional pallet materials.

BAYDUR® PUL 2500 TYPICAL PROPERTIES* OF MACHINE PROCESSED SYSTEM

Property	ASTM Test Method (Other)	Unit	Pultruded Bar**
Specific Gravity	D 792		2.10
Density	D 792	lb/ft3	130.0
Flexural Strength	D 790	psi	200,000
Flexural Modulus	D 790	psi	7,000,000
Flexural Strain	D 790	%	3
Short Beam Shear	D 2344	kpsi	> 9

* These items are provided as general information only. They are approximate values and are not part of the product specifications.

** Unidirectional composite properties measured on pultruded bar with ~ 81 wt. % glass.

These properties are critical to RM2's value proposition. Because of the strength and durability imparted by the polyurethane composite, the pallets can be used over and over again in automated, closed-loop, multi-trip supply chains with high numbers of movements. This enables RM2 to lease the pallets through long-term contracts with customers – a unique approach to material handling. This is complemented by the company's ERICA tracking system, which promptly identifies pallet locations and effectively minimizes pallet loss.

Life Cycle Analysis

For supply chains that reuse or could reuse pallets, the BLOCKPal™ pallets can translate into significant operational efficiencies, including:

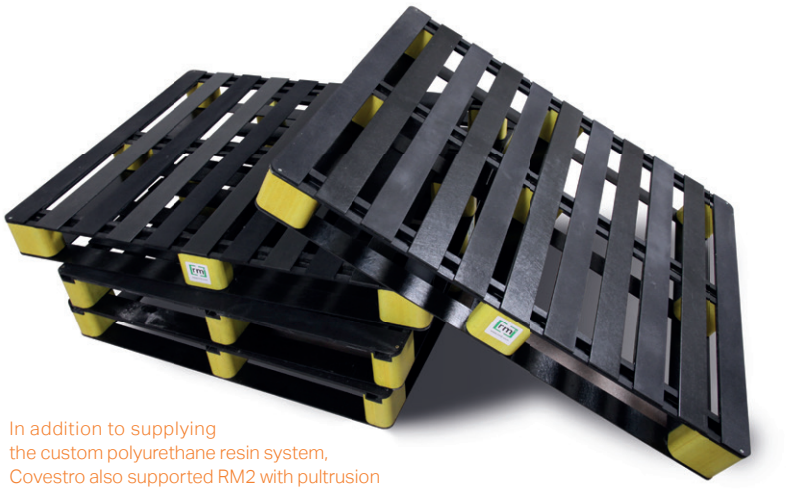
- Less product damage, downtime and repairs
- More pallets per truck for returns
- More trips per pallet

In fact, an independent, peer-reviewed Life Cycle Analysis (LCA) commissioned by RM2 and conducted by Pure Strategies in accordance with ISO 14040-14044 Standards indicates only 899 BLOCKPal™ pallets are required for 100,000 one-way trips. By comparison, five times as many wooden pallets – 4,400 – would be required to make the same number of one-way trips.

Pallet Trip Comparison

Average Wooden Pallet | Average Plastic Pallet | RM2 Pallet

In addition, the LCA indicates that due to its lighter weight, lower loss rate and longer life, the BLOCKPal™ pallet has a 21 percent lower global warming potential (GWP) impact and 50 percent lower total Primary Energy Demand than a typical wood block pallet.



In addition to supplying the custom polyurethane resin system, Covestro also supported RM2 with pultrusion tooling and process optimization, part design recommendations, material enhancements and on-site technical service.

RM2 BLOCKPal™ Pallets Provide Superior Performance

The pallets have also been independently tested by the Virginia Tech Center for Packaging and Unit Load Design and, according to RM2, the composite pallets regularly exceed industry standards. More specifically, BLOCKPal™ is:

- Tested to ISO 8611 and ASTM D1185 Standards
- Meets anti-fungal standard ASTM G21
- Naturally fire retardant and has passed the FM 4996 Standard
- ISPM 15 exempt
- Can be RFID and barcode enabled (optional)

Furthermore, the Virginia Tech testing demonstrates that the composite material utilized by BLOCKPal™ significantly increases pallet lifespan. This is an important differentiator, as extending pallet service life minimizes costly workflow interruptions and reduces the need to constantly replace traditional wood pallets.

Wooden pallets have another disadvantage: they are difficult to sterilize, which inhibits international shipping. The BLOCKPal™ pallet is resistant to contamination from bacteria or fungal growth, according to RM2 testing conducted in accordance with ASTM G21 and independently performed by Accugen Labs (see figure 1 and figure 2, below).

FIGURE 1

Sample	7 Days			14 Days			21 Days			28 Days		
RM2 - Lab 106491	0	0	0	0	0	0	0	0	0	0	0	0
Negative Control	0	0	0	0	0	0	0	0	0	0	0	0
Viability Control	4	4	4	4	4	4	4	4	4	4	4	4
Postitive Control (Wood Spatula)	2	2	2	3	3	3	4	4	4	4	4	4

FIGURE 2

Observations	Rating
None	0
Traces of Growth (less than 10%)	1
Light Growth (10 to 20%)	2
Medium Growth (30 to 60%)	3
Heavy Growth (60% to complete overage)	4

RM2 BLOCKPal™ Product Line Overview

BLOCKPal™ pallets are available in standard footprints: 1,200 mm x 1,000mm, 1,200 mm x 800 mm, 48 in. by 40 in. and 45 in. x 45 in., as well as in customized sizes for specialized applications.

BLOCKPal™ U.S. TECHNICAL AND PERFORMANCE SPECIFICATIONS

Type:	Rackable multi-trip Heavy Duty
Size:	48 x 40 x 5.1"
Base Type:	Full perimiter base runners (available also in 3-runner version as an option)
***Static Load:**	60,000 lb
Racking Load:	6,500 lb
[1]Dynamic Load:	9,800lb

* Uniformly distributed load
[1] Tested at the Virginia Center for Packaging and Unit Load Design – "safe-load"

The BLOCKPal™ pallets are resilient to extreme temperature or weather. They also feature:

- Uniform open top deck configuration that allows even distribution of product weight and easy cleaning
- Wide fork openings for easy access
- Low profile, full perimeter base runners for ease of handling
- Anti-skid coating for improved load management

Bringing material handling into the 21st Century

While wooden pallets have been integral to efficient material handling since the early 20th Century, they are subject to extreme environmental and load conditions that can considerably decrease their lifespan. They can splinter, warp, absorb moisture and deteriorate with continued use, which can cause workflow interruptions and increase costs. They can also be heavier than other materials, which can add cost during shipping and ultimately decrease the amount of cargo that can be transported.

Clearly, advanced composites technology offers the right solution at the right time for modernizing and enhancing the supply chain to address today's business realities, including the need to optimize efficiency and sustainability while reining in costs. Today, the innovative approach advanced by RM2 is changing the way customers look at pallets – from a consumable to an asset that can generate a significant accretive profit margin. The result is a pallet that, thanks in large part to polyurethane composite technology, not only delivers the goods, but also delivers a number of substantial benefits for users.

For more information about Covestro LLC polyurethane materials and technologies, call 412-413-2000 or visit www.polyurethanes.covestro.com.

For more information about RM2 and BLOCKPal pallets, email enquiries@rm2.com

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