Gurit CASE STUDY

ADVANCING GREEN LOGISTICS WITH INDETRUCK'S LIGHTWEIGHT PET TRAILER FLOORS

The transportation industry is under increasing pressure to enhance sustainability while meeting the demands of performance, efficiency, and durability. In response, Indetruck, in collaboration with materials manufacturer Gurit and supply chain partner Gazechim Composites Ibérica, developed an innovative trailer flooring solution utilizing recycled-PET materials, with significant results.

LIGHTWEIGHTING TO REDUCE EMISSIONS

As logistics moves toward decarbonization, the need for eco-friendly yet robust solutions is paramount. Traditional trailer floors made from wood contribute significantly to vehicle weight, increasing fuel consumption and emissions. Indetruck identified a gap for a lightweight, durable, and thermally-efficient trailer floor capable of withstanding the rigors of long-distance hauling.

The collaborative effort resulted in trailer floors composed of Gurit PET structural foam core, made from up to 100% recycled PET, replacing all wood components in the trailer floor, including the structural grid and plywood layers. Because of PET's inherent thermal properties, the PU layer used as insulation in the original construction was also removed from the laminate.

OVERVIEW

Indetruck, in collaboration with Gurit and Gazechim Composites Ibérica, developed a lightweight trailer flooring solution using recycled-PET materials. This innovation reduces vehicle weight by 33%, lowers fuel consumption, enhances thermal performance, and ensures durability.

Gurit's lightweight structural core materials, engineering expertise and practical know-how has helped Indetruck significantly reduce carbon emissions and align with industry efforts towards zero-emission vehicles and sustainable logistics.

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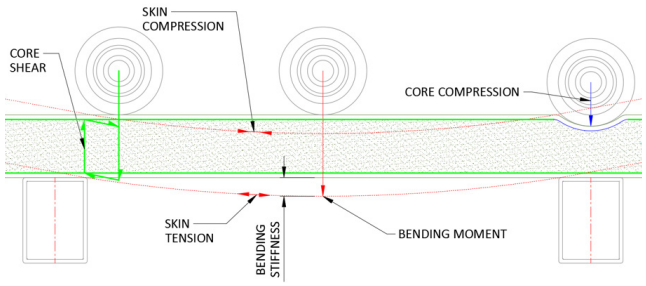
THE COMPLEXITY OF THE CHALLENGE

The original layup included plywood layers, a pinewood beam grid, PU insulation with frequent shear ties, and polyester-laminated bonding layers. Gurit's engineering team performed extensive structural analysis and testing to transition this incumbent laminate to a high-performing, lightweight PET solution compatible with existing manufacturing processes, and reducing costs by developing a panel with fewer constituent parts that would still address all needs.



Loading mechanisms of a truck floor panel

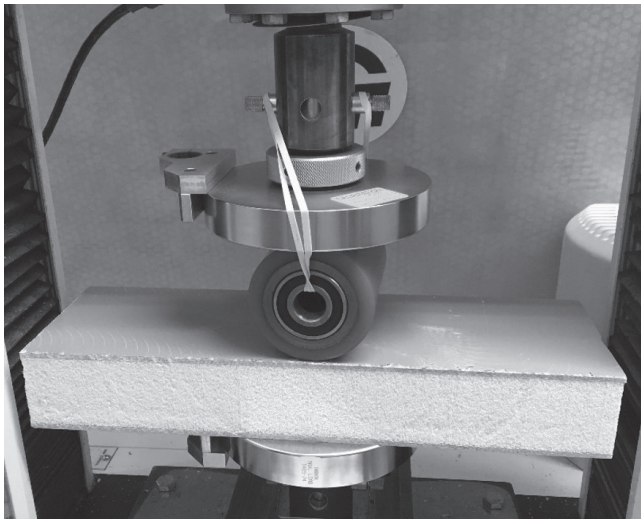
Loads in several scenarios need to be considered when designing a trailer floor, which adds to the complexity. A trailer floor will experience a point load, when a pallet is first loaded onto the floor, via a wheel or series of small wheels on a trolley or forklift. A dynamic load is experienced when the forklift or trolley transitions from the load dock onto the trailer floor. And then there is the bending load as the cargo moves over the trailer floor. This is complicated by the fact the loading is unlikely to be uniform, as the trolley navigates the trailer floor crossing from mid panel to stiff supporting members of the chassis – and consequently, the load transfer to the steel chassis frame also needs to be considered.

DESIGN AND TESTING FOR OPTIMIZATION

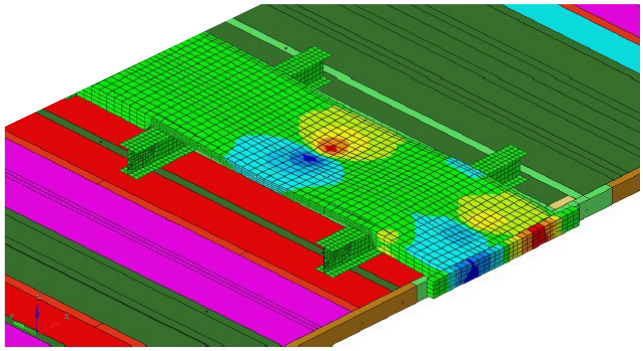
Analysis was carried out on a simplified representative panel to develop an equivalent composite solution which had similar mechanical behavior under the specified payload. Using Finite Element Analysis, this was verified under the varying load scenarios and geometry, while simultaneously considering weight, insulation, and cost. Full-scale load tests using strip beams were carried out to compare current and proposed methods.

The team estimated the cost of a floor panel that matched the strength and thermal performance of the existing design, proposing alternative floor to wall joint concepts to eliminate coach screws, assessing changes in material and labor costs and ensuring overall economic feasibility.

The new design proposed by Gurit's engineering team simplified this trailer floor structure, using versatile Gurit PET for impact resistance, insulation, and structural performance, and reducing the need for shear ties. Thick glass fiber skins and a high density PET were used in the upper surface to deal with the point loads, distributing the load down and out into a layer of lower density PET. Higher density could have been used throughout but that would have compromised the weight, cost and insulation goals.



Typical test set-up for point loading



Finite Element Analysis was used to validate the design

Gurit's processing experts collaborated with Gazechim and Indetruck to ensure a smooth material transition, integrating optimized resin controls to lower weight further.

To establish homologation and undergo thermal testing, Indetruck fabricated a prototype floor on-site, supported by Gazechim and Gurit; and later independently produced additional trailer floors with equally successful results.

POSITIVE SUSTAINABILITY IMPACT

By using Gurit's low weight PET structural foam core, Indetruck significantly reduces its carbon footprint during both truck manufacturing and in-service operation, thereby contributing to the decarbonization of the transportation sector.

The PET used in the trailer floors are part of a sustainable and circular manufacturing approach. In every Indetruck trailer floor, approximately 15,000 post-consumer PET bottles are used, saving them from landfill and reducing carbon emissions. In addition, Gurit's PET production waste is recycled back into the manufacturing process. By optimizing the material use and selecting lightweight structural materials, Indetruck is aligned with broader industry efforts to transition to zero-emission vehicles, as lighter trailer bodies are crucial for optimizing electric and hybrid truck performance and achieving the European Union's mandate for a 45% reduction in CO_2 emissions for new heavy trucks by 2030.

THE TRAILER OF THE FUTURE

Indetruck's innovative PET trailer floors represent a significant step towards sustainable logistics. The company has already produced several prototype trailers, with plans to scale production and expand the technology to other vehicle components. By leveraging Gurit's material expertise and Gazechim's supply chain support, Indetruck has set a benchmark for energy-efficient, durable, and eco-friendly transportation solutions. This initiative not only aligns with regulatory goals but also positions Indetruck as a leader in green transportation, paving the way for a more sustainable future.

Energy-efficient and durable PET trailer floor

KEY BENEFITS

ENERGY EFFICIENCY

The 33% reduction in floor weight translates directly into lower fuel consumption, delivering substantial cost savings and lower emissions throughout the vehicle's lifespan.

THERMAL PERFORMANCE

Gurit PET's inherent insulation properties led to a simplified floor laminate, with the more complex plywood/PU construction replaced with one single material that could meet all the thermal, strength and stiffness requirements. PET is therefore ideal for applications that are temperature-sensitive and can reduce energy requirements for refrigeration.

DURABILITY AND MAINTENANCE

Unlike wood, the PET composite resists rot*, corrosion, and wear, ensuring reliability in harsh conditions, reducing the need for maintenance, and extending the product's lifespan. (*Comparing moisture absorption by weight after 24 hours of immersion, Gurit PET has <2% moisture absorption versus commercial grade plywood which has 37%).

MANUFACTURING EFFICIENCY

The simplified design, as well as the lightweight and easy-to-mold nature of PET accelerates production, reduces labor costs, and minimizes waste, with Indetruck reporting a 15% reduction in assembly time, thereby increasing monthly output.

Gurit PET has achieved DNV type approval
Gurit PET has an EPD according to ISO 14025 and EN 15804
Photos (C) : Indetruck SL, Gurit