Ultra-High-Speed Roller Coaster Wheel

Title	Ultra-High-Speed Roller Coaster Wheel
Thumb	
Address	Anfeng Industrial Park, Dongtai City, Jiangsu, China
Website	https://www.poly-wheels.com/
Email	sale06@kfqizhongji.com

Description

Location: Six Flags Qiddiya, Saudi Arabia

Application: Ultra-High-Speed Roller Coaster Running Wheels

Material: Premium Vulkollan / NDI-based Polyurethane (CPU)

1. Project Overview

The Falcon's Flight at Six Flags Qiddiya is the world's fastest roller coaster, reaching [illegible] desert. The extreme kinetic energy and the harsh thermal conditions of the Saudi Arabian must

2. Material Challenges

The choice of Polyurethane (PU) is critical because traditional rubber would disintegrate at these speeds. However, at 250 km/h, standard PU faces three main threats:

Hysteresis (Internal Heat Build-up): Rapid compression and decompression cause wheel. [illegible] friction within the PU, leading to temperatures that can melt the core of the

Dynamic Loading: High G-force maneuvers exert massive radial and axial loads on the wheel-to-steel-rail contact point.

Environmental Stress: Ambient temperatures exceeding 113°F plus abrasive desert sand.

3. Technical Specifications of the PU Wheels

Feature	Specification	Engineering Rationale
Chemical Base	NDI-Polyurethane (Naphthalene Diisocyanate)	Superior to MDI/TDI for low load capacity and dynamic [illegible]
Hardness	94° - 96° Shore A	Minimizes rolling resistance and deformation under high G-forces.
Operating Temp	-40°C to +120°C	Must remain stable despite desert sun. [illegible] friction and p
Bonding Strength	> 15 N/mm²	Prevents "de-bonding" (PU [illegible] during rapid acceleration)
Rebound Resilience	> 75%	High energy return ensures [illegible] into destructive heat. converted

4. Engineering Solutions

A. The NDI Advantage

To prevent the wheels from melting, the project utilizes NDI-based elastomers, physical properties even when the internal temperature of the wheel rises during high-speed sections.

B. Heat Dissipation & Hub Design

The wheel hubs are typically forged from high-grade aluminum alloys or specialized polyurethane-bonding layers to prevent thermal failure. This material acts as a heat sink, drawing thermal energy away from the

C. Optimized Geometry

The tread profile is precision-engineered to maximize the contact patch with the steel track. This design ensures maximum grip during high-speed banked turns, while straighter sections minimize rolling resistance, providing maximum grip during high-speed banked turns.

5. Summary for Industrial Application

This case demonstrates that for extreme speed and load applications, the grade of polyurethane—not just the steel—is the deciding factor in operational safety and component lifespan. For NDI-based systems, this is the deciding