

Engineering Analysis and Operational Guide for the Bomag BW11RH Pneumatic-Tired Roller

Published: November 28, 2025 | Index ID: #675

Introduction to Pneumatic Compaction Technology

In the realm of modern pavement engineering, the pursuit of structural integrity and surface longevity is paramount. Among the diverse array of compaction equipment, the **Bomag BW11RH Pneumatic-Tired Roller** stands as a critical instrument for achieving high-density finishes in asphalt applications and granular base materials. Unlike traditional steel-drum rollers that rely primarily on static weight and vibration, pneumatic-tired rollers—often referred to as rubber-tired rollers—utilize a unique combination of **kneading action** and static pressure. This technical guide explores the engineering architecture, operational workflows, and maintenance protocols of the BW11RH series, providing a comprehensive resource for engineers, fleet managers, and site supervisors.

The BW11RH is designed to bridge the gap between initial breakdown rolling and final finishing. By employing a staggered arrangement of rubber tires, the machine ensures that the compaction force is distributed across the material in a manner that reorients aggregate particles, reducing air voids and enhancing the interlocking properties of the mix. This process is essential for preventing premature pavement failure such as rutting, cracking, and moisture infiltration.

Core Concepts and Theoretical Framework

The Kneading Effect: Mechanics of Rubber Tires

The fundamental principle behind the **Bomag BW11RH** is the **kneading effect**. When a rubber tire makes contact with a hot asphalt mat, it deforms slightly, creating a horizontal force in addition to the vertical load. This multi-directional pressure causes the aggregate particles within the asphalt mixture to shift and seat more securely against one another. Unlike a rigid steel drum, which can occasionally bridge over low spots or crush sensitive aggregates, the pneumatic tires of the BW11RH follow the contours of the surface, ensuring uniform density throughout the lift.

Contact Pressure and Tire Overlap

The effectiveness of a pneumatic roller is determined by its **ground contact pressure**, which is a function of three variables:

- **Wheel Load:** The total weight of the machine (including ballast) divided by the number of tires.
- **Tire Inflation Pressure:** The internal air pressure of the tires, which dictates the size of the contact patch.
- **Tire Size and Ply Rating:** The structural capacity of the rubber to withstand load and heat.

The BW11RH features a specific tire overlap configuration. This ensures that the gaps between the front tires are covered by the rear tires during a single pass, eliminating the risk of uncompacted strips. This overlap is critical for achieving a seamless surface texture, particularly in the final stages of asphalt compaction where aesthetic and functional smoothness are required.

Technical Specifications and Engineering Breakdown

The **Bomag BW11RH-5** represents the evolution of this series, offering a versatile weight range that can be adjusted based on project requirements. Understanding these specifications is vital for calculating the required passes and determining the optimal ballast configuration.

Weight and Ballasting Capabilities

The BW11RH is designed with a modular ballasting system. Operators can add or remove weight to achieve the desired ground pressure. The operating weight typically ranges from approximately **9,000 lbs (4,082 kg)** in its base configuration to upwards of **27,000 lbs (12,247 kg)** when fully ballasted with wet sand or steel weights.

Feature / Specification	Technical Data (Standard BW11RH)	Technical Data (BW11RH-5 Variant)
Operating Weight (Empty)	8,800 - 9,500 lbs	9,200 lbs
Operating Weight (Max Ballast)	24,000 - 27,000 lbs	27,000 lbs
Number of Tires	9 (5 Front / 4 Rear) or (4 Front / 5 Rear)	9 (Front: 5, Rear: 4)
Tire Size	7.50-15 14PR	7.50-15 14PR
Engine Model	Deutz or Cummins (Tier 4 Final in -5)	Kubota V3307 (Tier 4f)
Fuel Capacity	30 - 45 Gallons	39.6 Gallons
Max Working Speed	12 mph	12.4 mph

Hydrostatic Drive System

Modern BW11RH units utilize a **hydrostatic drive system**. This system allows for infinitely variable speed control and smooth transitions between forward and reverse. In pneumatic compaction, sudden stops or jerky starts can cause displacements in the hot asphalt mat (scuffing). The hydrostatic system in the Bomag BW11RH ensures that acceleration and deceleration are managed through hydraulic flow regulation, protecting the integrity of the mat.

Practical Implementation and Operation Guide

Pre-Operational Procedures

Before deploying the BW11RH to a job site, a series of technical checks must be performed. According to the **Bomag BW11RH Operation & Maintenance Manual**, the following steps are mandatory:

1. **Tire Pressure Calibration:** Ensure all tires are inflated to the same pressure. Discrepancies in tire pressure will result in uneven compaction and "ridging" on the asphalt surface.
2. **Ballast Check:** Verify the total machine weight against the mix design requirements. If compacting a thin lift, lower weights are preferred to prevent aggregate crushing.
3. **Scraper and Cocoa Mat Inspection:** Pneumatic rollers use scrapers and often cocoa mats to keep tires clean. These must be adjusted so they maintain consistent contact with the tire surface without causing excessive wear.
4. **Water Spray System:** Fill the water tank and test the spray nozzles. The water acts as a release agent, preventing hot asphalt from sticking to the rubber tires (pick-up).

Field Application: Compacting Asphalt

During the compaction process, the BW11RH should follow immediately behind the breakdown roller (typically a vibratory steel drum roller). The following operational parameters are recommended:

- **Temperature Window:** Pneumatic rolling is most effective when the asphalt temperature is between 175°F and 240°F (80°C - 115°C). If the mix is too hot, the tires may sink too deep; if too cold, the kneading effect is diminished.
- **Pass Pattern:** Start from the low side of the cross-slope and work toward the high side. This prevents the mat from shifting outward.
- **Tire Heating:** It is common practice to run the roller on a non-critical area until the tires reach a temperature close to that of the asphalt. Warm tires are less likely to experience asphalt pick-up.

Maintenance and Service Protocols

Longevity and reliability in heavy equipment are the results of rigorous adherence to service manuals. The **Bomag BW11RH Service Repair Manual** outlines a specific schedule for maintenance intervals.

Routine Service Intervals

Interval (Hours)	Component	Action Required
Daily / 10h	Engine Oil / Coolant	Check levels; inspect for leaks.
50h	Tire Pressure / Lug Nuts	Check and torque to specification.
250h	Fuel Filters	Replace primary and secondary filters.
500h	Hydraulic Oil Filter	Replace filter element; check oil acidity.
1000h	Hydrostatic System	Perform flow and pressure tests on pumps and motors.
2000h / 2 Years	Cooling System	Flush and replace coolant; inspect all hoses.

Hydraulic System Maintenance

The hydraulic system is the heart of the BW11RH. Contamination is the leading cause of hydraulic failure. When performing service repair, ensure that all work is done in a clean environment. The manual specifies the use of high-quality anti-wear hydraulic oil (ISO VG 46 or 68 depending on ambient temperature) to maintain the volumetric efficiency of the pumps.

Tire Care and Management

Since the tires are the primary compaction tools, their condition is paramount. Operators must check for:**Dry Rot and Cracking:** Exposure to UV and heat can degrade rubber.**Flat Spots:** Occur if the machine sits stationary with heavy ballast for extended periods.**Asphalt Build-up:**If the spray system fails, build-up must be removed manually with approved release agents (avoid petroleum-based cleaners as they degrade the rubber).

Troubleshooting Common Operational Challenges

Issue 1: Asphalt Pick-up on Tires

This is the most common challenge with pneumatic rollers. If the asphalt sticks to the tires, it tears the surface of the mat. **Solution:**Ensure the water spray system is fully functional. In some cases, the use of a non-petroleum-based additive in the water tank can reduce surface tension. Furthermore, ensure the tires are up to operating temperature before entering the fresh mat.

Issue 2: Surface Scuffing or Rutting

If the roller leaves deep ruts or scuffs the surface during turns. **Solution:**Reduce the ballast weight or increase the tire inflation pressure to stiffen the contact patch. Additionally, ensure the operator is making wide, gradual turns rather than sharp, stationary pivots.

Issue 3: Loss of Hydrostatic Power

If the machine struggles to climb grades or maintain speed. **Solution:**Check the hydraulic oil level and the condition of the suction strainer. Air in the system (aeration) can also cause power loss and noisy operation. Consult the service manual for the bleeding procedure of the hydrostatic loop.

Comparative Evaluation: BW11RH vs. Larger Pneumatic Models

In the BOMAG lineup, the BW11RH is considered a mid-range versatile unit. Larger models like the **BW24RH** offer higher productivity for massive highway projects, while the BW11RH is favored for municipal roads, parking lots, and secondary highways.

Metric	BW11RH-5	BW24RH	Selection Criteria
Compaction Width	68 inches	80 inches	BW24RH for wider lanes.
Max Weight	27,000 lbs	52,900 lbs	BW24RH for thick-lift heavy duty.
Turning Radius	Smaller/Compact	Larger	BW11RH for urban/tight sites.
Engine Power	74 hp	100+ hp	BW24RH for high-speed production.

The Evolution of the BW11RH-5

The transition to the "-5" generation introduced several technological advancements aimed at reducing operational costs and improving operator comfort. Key improvements include:

- **Enhanced Visibility:** The redesigned frame and sloped hood allow the operator to see the tire edges more clearly, which is vital for edge compaction near curbs or adjacent lanes.
- **Tier 4 Final Compliance:** The integration of advanced engine technology (like the Kubota V3307) reduces emissions without sacrificing torque, utilizing Diesel Oxidation Catalysts (DOC) or Selective Catalytic Reduction (SCR) depending on the region.
- **Ergonomic Controls:** The operator station now features a multi-function travel lever and an intuitive dashboard that provides real-time feedback on engine health and system pressures.

Engineering Analysis of Ground Contact Pressure (GCP)

To truly master the use of the BW11RH, one must understand the mathematical relationship between wheel load and inflation pressure. The Ground Contact Pressure (GCP) is roughly equivalent to the tire inflation pressure plus the structural stiffness of the tire carcass (usually 5-10 psi).

Formula: $GCP = H$ (Wheel Load / Contact Area)

By adjusting the inflation pressure via the optional **central tire inflation system (CTIS)**, the operator can change the GCP on the fly. This allows for higher pressure during the initial passes to achieve deep compaction and lower pressure during the final passes to achieve a smooth, closed surface. This flexibility is what makes the BW11RH an indispensable tool for high-specification asphalt work.

Summary and Broader Implications

The Bomag BW11RH Pneumatic-Tired Roller is more than just a piece of heavy machinery; it is a precision engineering tool designed to optimize the lifespan of our transportation infrastructure. Through the application of the kneading effect, the BW11RH ensures that asphalt pavements possess the density required to withstand the stresses of modern traffic loads and environmental fluctuations.

For owners and operators, the value of the BW11RH lies in its versatility and its relatively low cost of operation when compared to the structural benefits it provides. By adhering to the maintenance schedules found in the **Service Repair Manuals** and understanding the core mechanics of pneumatic compaction, fleets can ensure that their BW11RH units remain productive for decades. As paving technology continues to advance, the fundamental

principles of rubber-tired compaction—relying on contact pressure and material manipulation—remain a cornerstone of quality road construction.

Ultimately, the successful deployment of the BW11RH requires a synergy between mechanical capability and operator expertise. From the careful calibration of tire pressures to the strategic application of ballast, every adjustment made to the machine has a direct impact on the quality of the finished road. As we look toward the future of infrastructure, machines like the BW11RH will continue to play a pivotal role in building durable, safe, and efficient thoroughfares across the globe.

Baca Juga (Artikel Terkait)

- [Comprehensive Technical Analysis of Liebherr 904 Litronic Series: Engineering, Maintenance, and Operational Optimization](#)

URL: <http://alghafgolden.com/liebherr-904-litronic-technical-guide.pdf>

- [The Bobcat 863 Skid Steer Loader: A Comprehensive Technical Maintenance and Engineering Analysis](#)

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- [Engineering Excellence in Soil Compaction: A Comprehensive Technical Analysis of Bomag BW 216, 219, and 225 Series Single Drum Rollers](#)

URL: <http://alghafgolden.com/bomag-bw-216-219-225-technical-guide.pdf>

- [Comprehensive Engineering Guide to BOMAG Single Drum Rollers: Maintenance, Operation, and Technical Analysis of BW 216, 219, and 226 Series](#)

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