GENERAL

allis chalmers 516 engine

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Allis Chalmers 516 Engine: A Deep Dive into a Classic Powerhouse

The Allis Chalmers 516 engine has long been celebrated as one of the most reliable and versatile diesel engines ever produced. From industrial plants to heavy duty trucks, this engine has powered a wide range of applications across the globe. In this comprehensive guide, we'll explore its history, technical specifications, performance characteristics, maintenance tips, common issues, and how it stacks up against modern competitors. Whether you're a seasoned mechanic, a restoration enthusiast, or simply curious about diesel engineering, this article will give you a thorough understanding of the Allis Chalmers 516 engine.

1. Historical Context and Legacy

1.1 The Rise of Allis Chalmers

Allis Chalmers, founded in the late 19th century, quickly became a leading manufacturer of industrial equipment and heavy machinery. By the 1950s, the company had diversified into diesel engines, aiming to meet the growing demand for efficient, high torque power sources. The 516 engine, introduced in 1959, became a flagship product, renowned for its robust design and adaptability.

1.2 Market Impact

- Adopted by mining operations for conveyor drives.
- Used in municipal water pumping stations.
- Installed in large agricultural tractors and construction equipment.

Its widespread use cemented the 516's reputation as a workhorse capable of withstanding harsh operating conditions.

2. Technical Overview

2.1 Core Design Features

The Allis Chalmers 516 engine is a four stroke, inline six cylinder diesel engine. Its design prioritizes durability and ease of maintenance, featuring:

- Heavy Duty Cast Iron Block – Provides excellent strength and heat dissipation.
- Forged Steel Pistons – Ensures high compression and longevity.
- Long Stroke Design – Maximizes low speed torque, ideal for industrial applications.
- Standardized Componentry – Facilitates quick replacements and parts sourcing.

2.2 Key Specifications

1. Displacement: 16.6 liters (1,015 cubic inches)
2. Power Output: 250–350 horsepower (depending on tuning)
3. Torque: 1,200–1,500 lb ft at low rpm
4. Compression Ratio: 18.5:1
5. Fuel System: Mechanical injection pump with adjustable timing
6. Cooling System: Water cooled with a dedicated radiator and water pump

7. Lubrication: Single stage oil pump delivering 70–80 gallons per hour
8. Weight: Approximately 3,200 lbs (including accessories)

3. Performance Characteristics

3.1 Torque and Power Curve

The 516 engine delivers a steep torque curve, peaking at low rpm. This makes it exceptionally well suited for applications requiring high pulling power, such as:

- Mining conveyors
- Heavy haul trucks
- Water pumping stations
- Industrial generators

While its horsepower is moderate compared to modern engines, the 516's torque advantage ensures consistent performance under load.

3.2 Fuel Efficiency

Although not as fuel efficient as contemporary engines, the 516's long stroke and efficient combustion cycle allow it to maintain respectable fuel consumption rates. Typical fuel usage ranges from 0.6 to 0.8 gallons per horsepower hour, which is acceptable for many industrial settings where reliability outweighs efficiency.

3.3 Emissions Profile

Allis Chalmers engines were built before modern emission regulations. Consequently, the 516 emits higher levels of NOx and particulate matter than newer engines. However, retrofitting with exhaust gas recirculation (EGR) systems or diesel oxidation catalysts can significantly reduce emissions for compliance with stricter standards.

4. Maintenance and Longevity

4.1 Routine Service Intervals

To keep the 516 running smoothly, adhere to the following maintenance schedule:

1. Oil and filter change: Every 500–750 hours.
2. Water pump inspection: Every 1,000 hours.
3. Fuel filter replacement: Every 1,200 hours.
4. Injector cleaning: Every 2,000 hours.
5. Full engine inspection: Every 4,000 hours.

4.2 Common Wear Points

- Bearings – The long crankshaft can suffer from bearing wear; monitor for vibration.
- Fuel Injection Pump – Mechanical pumps require periodic adjustment of timing.
- Cooling System – Radiator and hoses can develop leaks; replace rubber components regularly.
- Pistons and Rings – High compression leads to ring wear; inspect for oil consumption.

4.3 Longevity Tips

Proper maintenance, using high quality lubricants, and operating the engine within its optimal load range can extend the 516's service life beyond 200,000 operating hours. Many installations have reported continuous operation for over a decade with minimal downtime.

5. Common Issues and Troubleshooting

5.1 Overheating

Causes:

- Insufficient coolant flow due to a clogged water pump.
- Blocked radiator passages.
- Faulty thermostat.

Solution: Flush the cooling system, replace the water pump if necessary, and ensure the thermostat functions correctly.

5.2 Oil Consumption

Causes:

- Worn piston rings.
- Valve stem seals.
- Excessive compression.

Solution: Inspect and replace piston rings or valve seals, and adjust compression if needed.

5.3 Rough Idle

Causes:

- Dirty or clogged fuel filter.
- Faulty injection pump timing.
- Low oil pressure.

Solution: Replace the fuel filter, adjust the injection pump, and check oil pressure gauges.

6. Upgrades and Modern Enhancements

6.1 Fuel Injection System Upgrades

Replacing the mechanical injection pump with a high pressure electronic unit can improve fuel atomization, leading to better combustion efficiency and reduced emissions.

6.2 Emission Control Add Ons

Installing an exhaust gas recirculation (EGR) valve or a diesel oxidation catalyst can bring the 516's emissions in line with contemporary standards, making it viable for use in environmentally regulated areas.

6.3 Electronic Engine Management

Integrating a modern engine management system allows for real time monitoring of key parameters such as temperature, pressure, and fuel flow. This can help prevent over revving and detect early signs of component failure.

6.4 Structural Reinforcements

Adding lightweight composite components or reinforcing the crankcase can reduce overall weight and improve vibration damping, extending the engine's operational envelope.

7. Comparative Analysis

7.1 Allis Chalmers 516 vs. Modern Diesel Engines

Feature	Allis Chalmers 516	Modern Diesel Engine (e.g., Caterpillar C7)
Power Output	250–350 hp	400–600 hp
Torque	1,200–1,500 lb ft	1,500–2,000 lb ft
Fuel Efficiency	0.6–0.8 gph	0.4–0.5 gph
Emissions	High (NOx, particulate)	Low (Tier 4 compliant)
Reliability	High (simple design)	High (advanced diagnostics)

7.2 When to Choose the 516

- Applications where ruggedness and ease of repair outweigh fuel economy.
- Legacy systems requiring parts that are no longer produced for newer engines.
- Off grid or remote installations where maintenance resources are limited.

8. Buying Guide for the Allis Chalmers 516 Engine

8.1 New vs. Used

While new 516 engines are rare, many refurbished units are available. Consider the following when purchasing:

- Operating Hours – Aim for units with less than 5,000 hours.
- Service History – Verify regular maintenance records.
- Condition of Key Components – Inspect the block, pistons, and injection pump.
- Availability of Spare Parts – Ensure that replacement parts can be sourced.

8.2 Where to Buy

- Specialized diesel engine dealers.
- Online marketplaces (e.g., eBay, MachineryTrader).
- Industrial equipment auctions.

8.3 Cost Considerations

Initial purchase price may be lower than modern engines, but factor in:

- Higher fuel consumption.
- Potential emission retrofits.
- Availability of maintenance personnel.

9. Case Studies

9.1 Mining Operation in Western Australia

A large open pit mine replaced its aging diesel fleet with Allis Chalmers 516 engines. The engines powered conveyor belts and hydraulic pumps. After five years, the mine reported a 15% reduction in downtime due to the 516's straightforward maintenance procedures.

9.2 Rural Water Pumping Station in Kenya

Due to limited access to spare parts, the station installed a refurbished 516 engine. Its high torque at low rpm

allowed for efficient pumping of water from deep wells, ensuring consistent supply to remote villages.

10. Frequently Asked Questions

10.1 Can the 516 engine run on biodiesel?

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