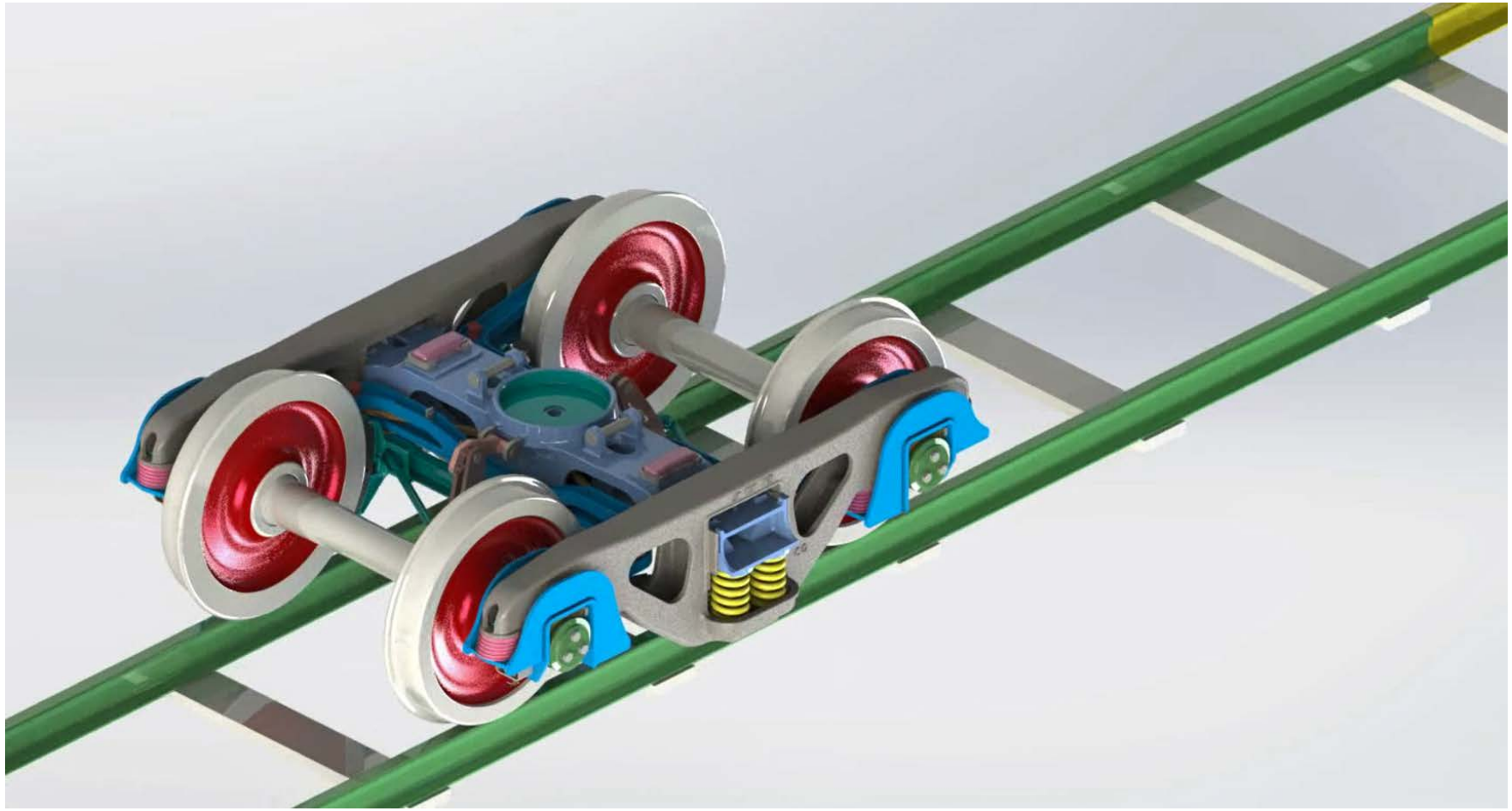
Scheffel Self-Steering Bogie Introduction



Contents

01 Overview

Basic Information

- ✓ The Scheffel Bogie was independently developed by our company by introducing South African Scheffel bogie technology, and has been successfully applied in South Africa, Mozambique, Taiwan, and other countries and regions.
- ✓ This bogie features a simple structure, convenient maintenance, and excellent performance, and is widely used in heavy-haul and rapid freight transportation worldwide.

R&D Background

- ✓ The Scheffel bogie was first put into use in 1975 in the South African Railways (SAR) ore wagon fleet, named after its inventor, Dr. Herbert Scheffel. The Scheffel Bogie he designed promoted the development of South Africa's 1067mm narrow-gauge railway system.
- ✓ In 1978, a South African Class 6EI train equipped with Scheffel Bogie participated in a high-speed test, reaching a speed of 245 km/h, setting a world narrow-gauge speed record.
- ✓ For the operating principle, please refer to the demonstration animation.

Scheffel Bogie Main Technical Parameters

Gauge (mm)	1067	Side Bearing Center Distance（mm）	1130
Wheelbase（mm）	1753	Axle Load（t）	14/20
Wheel Diameter（mm）	860	Tare Weight（t）	Approx. 4.0
Center Plate Diameter（mm）	396	Maximum Operating Speed（km/h）	100
Minimum Curve Radius Negotiable（m）	100	Foundation Brake Device Brake Ratio	5

Scheffel Bogie Exported to Mozambique

Scheffel Bogie in Batch Exported to Taiwan Region

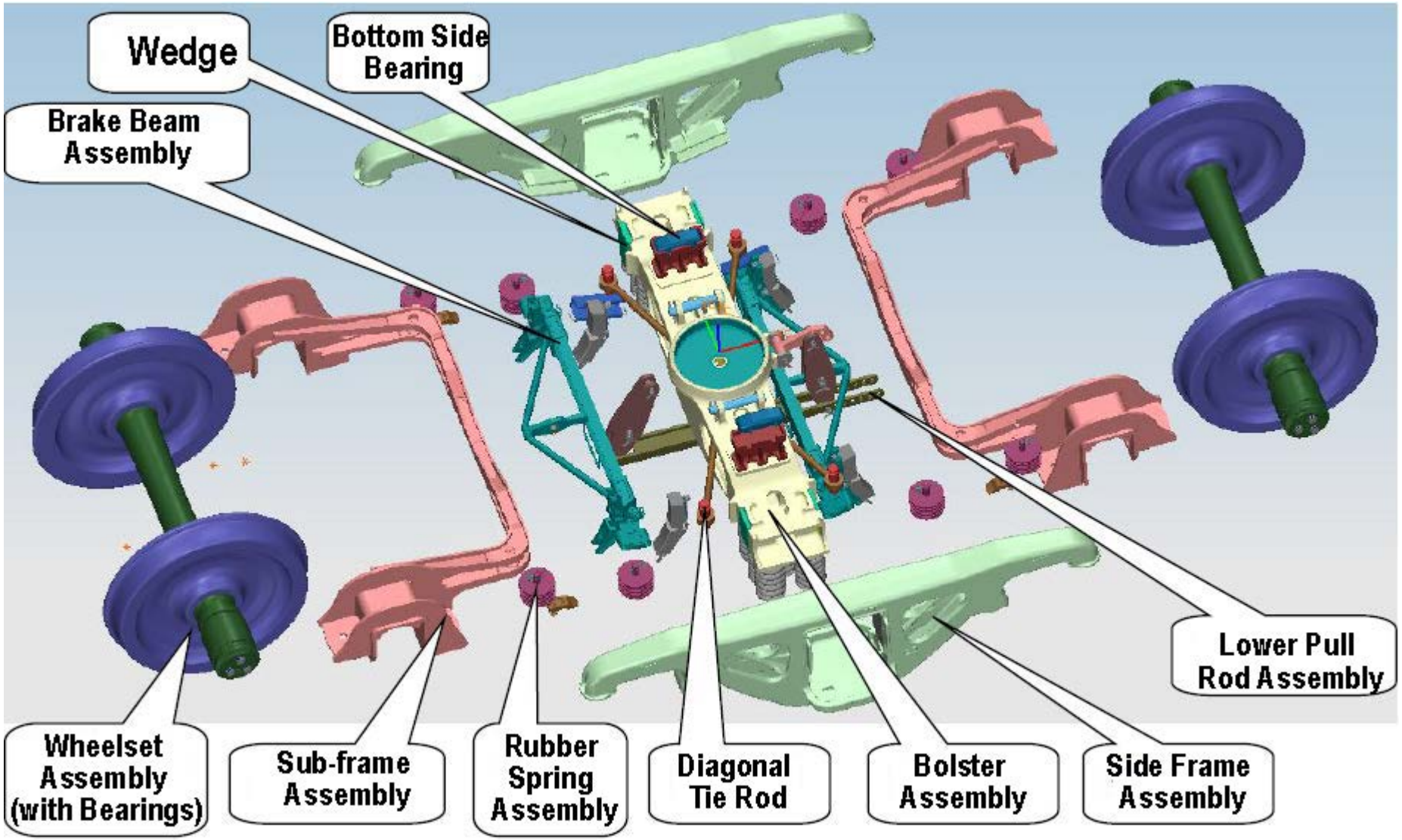
Actual Vehicle Equipped with Scheffel Bogie

02 Main Structural Composition

Main Structural Composition

- ✓ The Scheffel Bogie mainly consists of wheel-axle assembly, side frame assembly, bolster assembly, sub-frame device, primary suspension device, center suspension device, foundation brake device, etc.
- ✓ This bogie is improved based on the traditional "three-piece" bogie design, inheriting the advantages of the traditional "three-piece" bogie such as simple structure, convenient maintenance, and good load equalization performance.
- ✓ A self-steering device jointly composed of rubber springs and a sub-frame device is added between the two wheel sets.

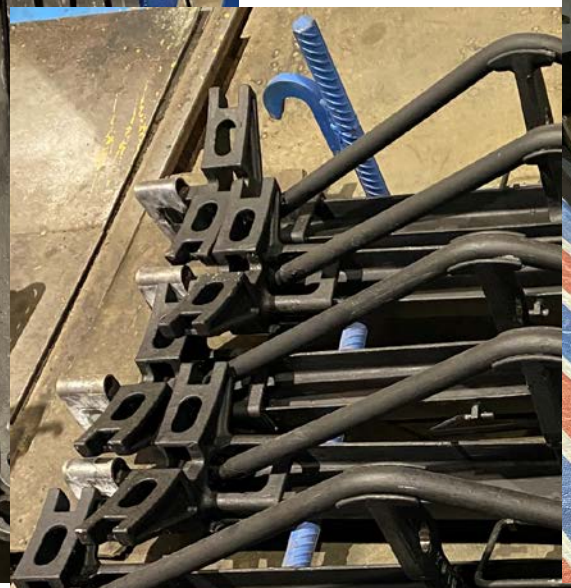
Main Structural Composition



Main Structural Composition

Brake Beam Assembly

Lower Pull Rod Assembly



Sub-frame Assembly

03 Advantages and Features

Advantages and Features

- ✓ Based on the original "three-piece" bogie, the Scheffel Bogie connects the left and right bearing saddles of one wheel set to form a U-shaped sub-frame.
- ✓ The front and rear two wheel sets are pin-connected to the two U-shaped sub-frames via diagonal rods, thereby forming a self-steering mechanism.
- ✓ This achieves improved hunting stability and enhanced curve negotiation ability.
- ✓ It resolves the contradiction between running stability and curve negotiation performance of conventional bogies.

Advantages and Features

✓ Compared with conventional "three-piece" bogies, it mainly has the following advantages:

1. Improved running quality of the bogie.
2. Higher operating speed.
3. Enhanced system stability.
4. Reduced wheel flange and rail wear.
5. Reduced construction costs for new railway lines.
6. Improved transportation efficiency.
7. Reduced maintenance costs for wheels and rails.
8. Reduced energy consumption and noise.
9. Reduced derailment accidents.

Advantages and Features

- Taking South African iron ore export as an example to calculate the cost savings of using Scheffel Bogie over a full life cycle:
  - For a traditional "three-piece" bogie with an axle load of 18.5 tons, on average after running 75,000 km, the wheels need re-profiling due to flange wear. The average service life of a multi-wear wheel is 400,000 km.
  - For a Scheffel Bogie with the same axle load, due to the absence of flange wear, only tread wear needs to be considered, and its service life can reach 2,000,000 km.
  - Calculating based on a bogie service life of 25 years (3.75 million km).
  - The Scheffel Bogie has an increased initial manufacturing cost of approximately $1,500 compared to traditional bogies (e.g., Barber, controlled type).

Advantages and Features

- The total cost caused by wheel consumption over a bogie's life cycle is (not considering wheel repair and wheel set re-assembly costs):

	Number of Wheels Consumed	Unit Price per Wheel (USD)	25-Year Total (USD)
Traditional Three-Piece Bogie	36	Approx. 700	**25200**
Scheffel Bogie	**8**	**Approx700**	**5600**

- After deducting the increased initial manufacturing cost, the Shephard bogie saves a total compared to the traditional "three-piece" bogie:
S=25200-5,600-1,500=18,100 (US$)

04 Related Application Performance

Related Application Performance

- ✓ The Scheffel Bogie was independently developed by our company by introducing South African technology. It has multiple series such as C-axle (axle load 14t) and D-axle (20.5t) for selection, and can also be adjusted and designed according to customer requirements to suit various vehicle types.
- ✓ Currently, the Scheffel Bogie produced by our company have been successfully applied in South Africa, Mozambique, Taiwan, and other countries and regions. Several projects we provided for Taiwan, such as Taiwan wiring flat cars, metro flat cars, and flatbed trolleys, are all equipped with Scheffel Bogies. The feedback from actual operation is good, gaining user recognition, and subsequent batch purchases of Scheffel Bogies have been realized

Related Application Performance