AIR SUSPENSION SYSTEM

MTNS NC depot
Working Principle

- Air suspension is a suspension where properties of air are used for cushioning effect.
- Air springs are height-controlled load levelling suspension devices.
- With changing loads, air spring reacts initially by changing the distance between air spring support and vehicle body.
- The height monitoring valve (called levelling valve) is in turn actuated, either taking the compressed air pressure to the air spring or releasing air pressure from it to the atmosphere.
- This mechanism ensures a constant floor height on coaches provided with air springs, irrespective of the load.
Air Suspension System in ICF Bogie

- With steel spring
- With air spring
Air Suspension System in FIAT Bogie

- With steel spring
- With air spring
Needs for adoption of Air Suspension on IR
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• Abnormal increase in pay load condition
  - e.g. Trailer coach of EMU (tare wt. 32.5T) pay load increased from 18T to 34T.

• Super dense crush load reduces the bogie clearance to Nil
  - Resulting in severe hitting and consequent failure of components.

• Poor riding behavior of coach.

• Need to maintain “Ride Height” to have parity with
Project Undertaken by RDSO

- In 2001 a trial done by RDSO:
  - On 3-point and 4-point air suspension coaches (02Nos. each).
- After the trial RDSO declared:
  - 3-pt. suspension system not suitable for service.
- One of the trialed coach with 3-point suspension system was converted to 4-point system and
Implementation

- Coaches manufactured
  - ICF Coaches
    - Turned out from RCF in Feb’07.
  - Hybrid Coaches
    - Turned out from RCF in Sept’07.
    - LHB Coaches with FIAT bogies
      - Power Car: Turned out from RCF in Aug’08.
      - Hot Buffet car: Turned out from RCF in Dec’08
  - Double-Decker Coaches
Comparison with Existing System

- Coil springs have constant stiffness property.
- Air springs offer a load proportionate stiffness
  - Through their control mechanism,
  - Retain their height under changing loads.
  - Keep floor height constant.
- Under high payload situation, space constraint becomes critical, leading to the
Spring Actions Achieved

• Vertical Spring Action: achieved by compression of air
• Lateral Spring Action: by variation in effective area
Spring Actions Achieved

- Damping Characteristics
  - Good self damping achieved by
    - placing an optimized orifice between air spring and additional reservoir of 40 litres capacity.
Schematic Diagram

Feed Pipe

Additional AR 150 lit.

IC : Isolating Cock
NRV : Non Return Valve
LV : Limiting Valve
AS : Air Spring
FT : Filters
MR : Main
AR : Air Reservoir
DCV : Duplex Check Valve
एयर पाईप लाइन

एम आर 150 लीटर

एयर सस्पेशन उपकरणों का रेखाचित्र
Actual Diagram

Bogie General Arrangement with Air Spring Retrofitment