

# BOOSTING FREIGHT CAPACITY THROUGH FATIGUE TESTING

RESEARCH DESIGN AND STANDARDS ORGANIZATION (RDSO)/  
INDIAN RAILWAYS

## Summary

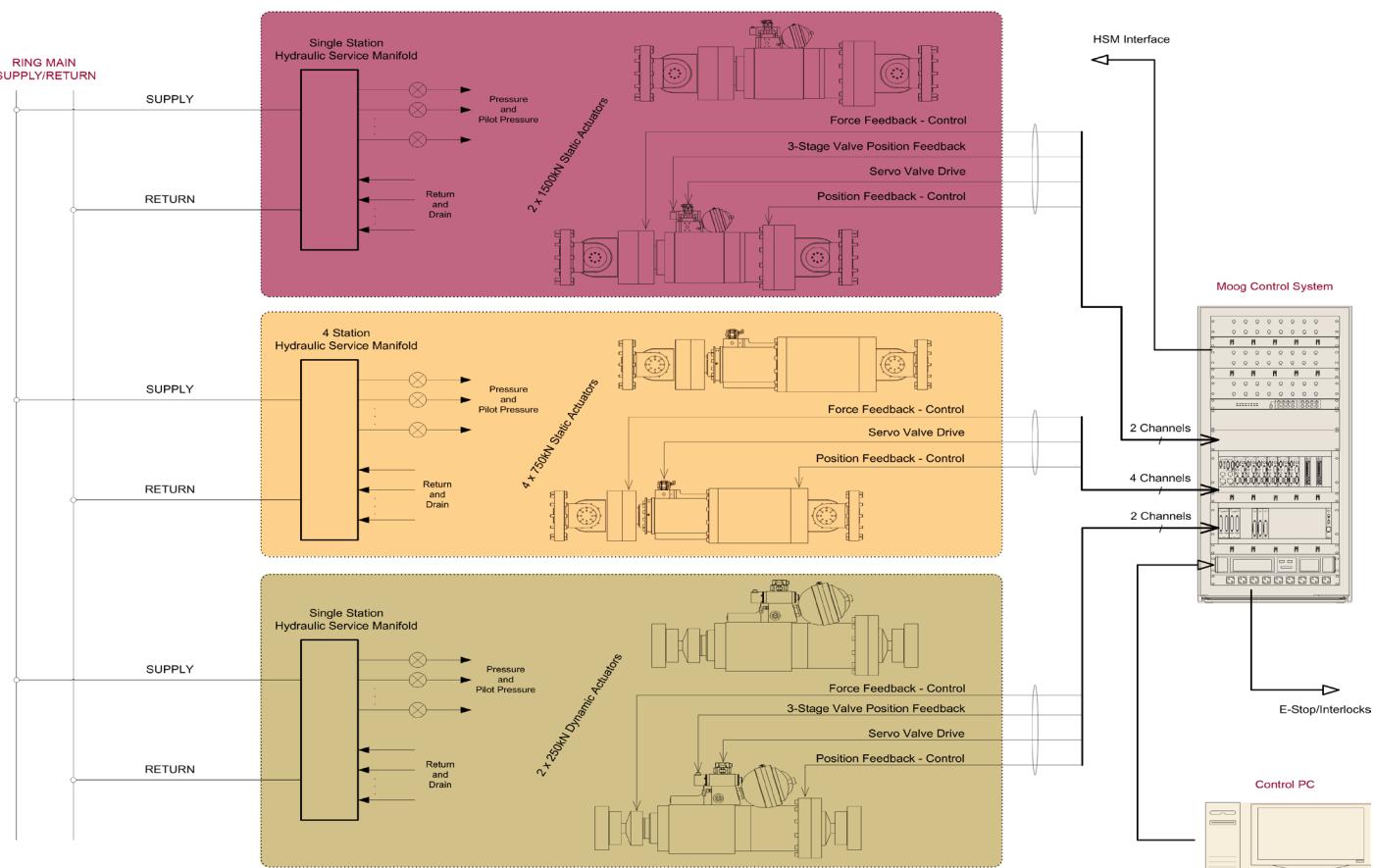
The Indian Railways and the Research Design and Standards Organization (RDSO) required a full-scale fatigue test system to perform payload testing on freight wagon bogies. Moog supplied a 5000 kN bogie test system which led to an increase in freight capacity and aided profitable operations for the Indian Railways.

## Background

The Indian Railways is the state-owned railway organization in India and operates one of the largest railway networks in the world. An affiliate body, known as the Research Design and

Standards Organization or simply RDSO, functions as a technical advisor to the Indian Railways and the railway board on the design and standardization of railway equipment.

As the dedicated freight corridor was still under development, Indian Railways needed to extract more from the existing rail infrastructure to meet the ongoing rise in demand for freight capacity. RDSO engineers designed new test requirements to assess payload parameters on bogies and ultimately increase payload capacity. Moog, a global leader in providing high-performance simulation and test equipment for aerospace, automotive and other research labs, was entrusted with the task of developing a 5000 kN full-scale fatigue test system to perform speed and payload testing on freight wagon bogies.



Moog Test System is tailored to meet RDSO's specific requirements

## RDSO's objectives

- Design new test requirements to assess payload parameters on bogies
- Procure a full-scale fatigue test system to allow for the design and validation of axle load wagons of up to 40 tons as against the existing 20 to 25 ton models.
- Extract more freight carrying capacity from the existing rail infrastructure to meet the ongoing rise in demand.

## Project success factors

Some key factors that played an important role in the selection of Moog for this assignment are:

- A good match between price and test capabilities
- Comprehensive proof-of-concept demonstrated by Moog engineers
- Prior global experience in similar large-scale installations

Moog was selected to design and develop this solution despite RDSO's long standing relationship with a well-established competitor. The overall timeframe from design to implementation was aggressive, but Moog engineers made sure that delivery happened well within the schedule of 11 months.

## The technical challenge

The Moog team of engineers faced several primary challenges:

- Create and measure force to simulate fatigue tests on bogie frames which entails building a massive test system with a high level of technical complexity
- Harness global resources and products and implement locally
- Design and develop the test system within an aggressive time frame with no scope for trial and error.

## The Moog solution

Moog designed and built a full-scale fatigue test system which simulates real running conditions for the Indian Railways. The system can test new bogies with higher payload capacity for increased freight-carrying and speed performance on the existing rail network. Equipment and components were sourced from several Moog sites globally, while the entire test system was implemented at RDSO's facility in Lucknow, India.

Using the latest Moog Test Controllers, RDSO engineers can conduct a variety of tests on the test article ranging from edge-bounce loading and centre-bounce loading for bolsters, vertical transfers and centre tests for side-frames in addition to rock loading.

The Moog Test System allows the application of static loads through servo hydraulic systems. The respective strains are recorded, in addition to deflections, which are monitored by external extenso meters. A test sequence is then created and

the system is ready for dynamic loading. The tests are then configured to go on for a desired number of cycles. Overall, Moog delivered a high-performance fatigue test system which met all of RDSO's requirements.

The test system featured the following:

- 5000 kN four-column Portal Frame
- Hydraulic Power Units – a total of 1200 lpm
- Hydrostatic Servo Actuators – eight actuators (four 750 kN, two 1500 kN and two 250 kN)
- 8-channel Digital Test Controller
- Strong floor design with a unique frame concept
- Bed plate
- 96 channel HBM Data Acquisition System

### PORTAL FRAME - 4 COLUMN



500 ton capacity 4 column portal frame for heavy duty vertical tests

- Capacity 5000 kN
- Two Transverse Beams
- Two Longitudinal Beams
- Electrical Height Adjustment for crosshead
- Special Roller Clamps for easy movement for Actuator and transverse beams
- Hydraulic Tool for fixing bolts

## Benefits of the Moog Test System

- The system can test loads up to 500 tons (Dynamic)/600 tons (static)
- Best-in-class technology and products requiring minimal maintenance
- The system, backed by Moog's global expertise, will enable RDSO to boost freight capacity and revenues

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