

## MTS Pantograph Test System



Photo courtesy of China Academy Railway Sciences

The MTS Pantograph Test System installed in a test lab.

For trains to operate efficiently, the pantograph must maintain constant contact with trolley wires suspended from catenary systems. Yet these wires and their support structures exhibit different vertical stiffness along given sections. The catenary system zigzags in 30 to 100-meter intervals to prevent grooving. The force that the pantograph applies to the wire must stay within a well-defined range (70 N to 120 N). If it is too low, loss of contact results in arcing, which not only causes the train to lose power but damages the trolley wire and the contact bar through etching and overheating. If the force is too high, the resulting friction wears down the wire and contact bar prematurely.

The latest system developed by MTS provides a complete simulation of the pantograph loading environment. It enables manufacturers and test engineers to study the pantograph and trolley wire's dynamic interaction with great accuracy and precision:

- » Off-line ratio (the time when contact is reduced)
- » Resistance of contact
- » Power factor
- » Arcing time and intensity
- » Temperature of the contact bars
- » Real-time measurement of wear and profile change of the wire and contact bar

### SYSTEM PERFORMANCE

Displacement Velocity Acceleration Frequency			
Disc Vertical	Zig Zag	Speed	Table Vertical
+/-100 mm	+/-350 mm	--	+/-75 mm
900 mm/s	250 mm/s	550 kgh	400 mm/s
6 g	2 g	<60 seconds	6 g
10 Hz	15 Hz	--	30 Hz

### SYSTEM CONTROL CHANNELS

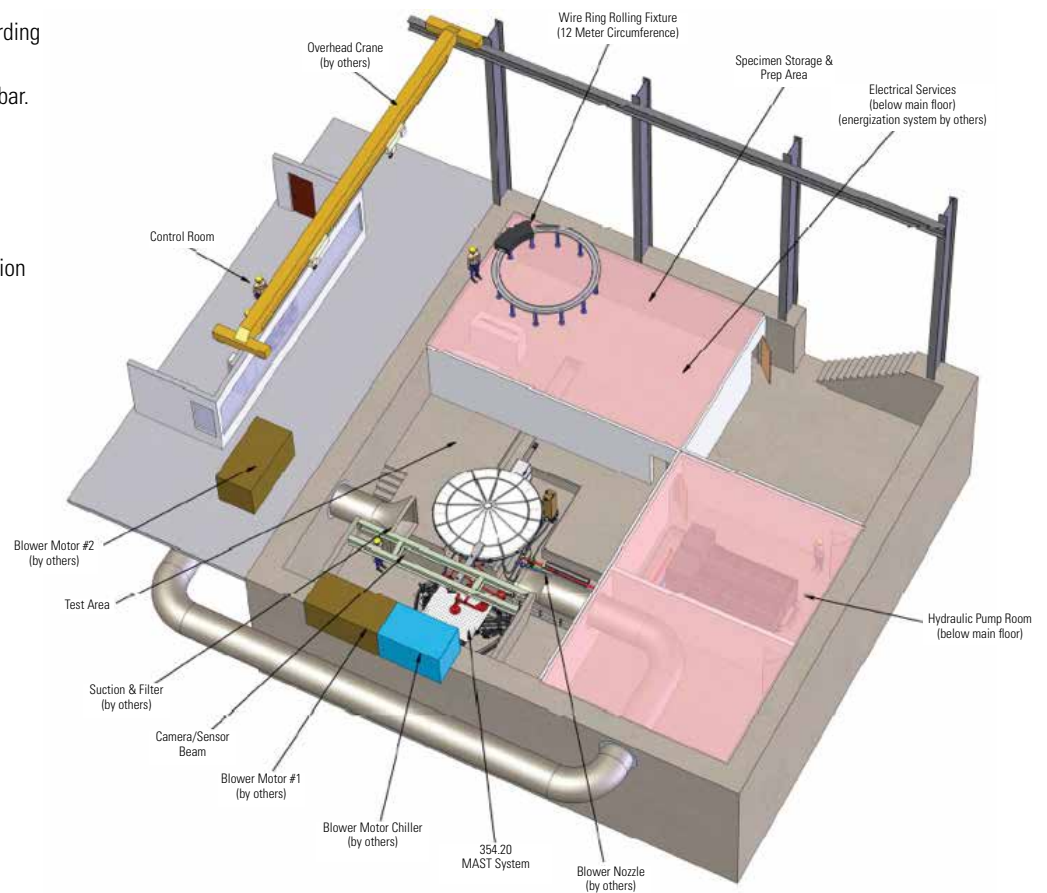
- » Wire
  - Vertical displacement
  - Horizontal (zig-zag) displacement
  - Wire velocity
- » Pantograph vertical motion
- » Pantograph lift/drop
- » Voltage
- » Cooling Air

## SYSTEM MONITOR CHANNELS

- » Main shaft bearings
  - Temperature
  - Vertical and horizontal acceleration
- » Automatic lubrication system
- » Hydraulics
  - Oil level, oil temperature, filter etc.
- » Drive motor
  - Temperature, torque, RPM etc.
- » Limits on any data channel
  - Warning, shut-down

## SYSTEM MONITORING INSTRUMENTATION

- » Contact Bars
  - Load measurement
    - « Contact load
    - « Drag load
  - Temperature
    - « RDT transducers
    - « Thermal imaging camera with recording capability
  - Acceleration on each end of contact bar.
  - Wear
    - « Laser profilometer
- » Wire
  - Rotational position
    - « Encoder counts during each revolution of drive system
    - « Pulse tach to count rotations and reset encoder
  - Wear
- » Current measurement
- » Voltage measurement
- » Arc detection



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