Car builder perspective on wheel / rail noise and vibration requirements and mitigation measures

Bryce Dudgeon, Siemens Rail systems
FTA performance requirements are flowed down to specific design requirements

Typical LRV design requirements – specifics from flow-down

- General design requirements defined by spec:
  - Wheel / rail interface defined:
    - Wheel profile
    - Wheel types permissible (resilient)
    - Back-to-back dimensions
    - Truck and axle spacing
  - Vehicle architecture – e.g. low-floor of given length, capacity, and number of trucks, and weight
  - Primary suspension types and permissible natural frequency
  - In all cases: vehicle running behavior assessment deliverable
  - In some cases: wheel / rail interface study deliverable

Noise and vibration mitigation measures, LRVs

Spin/slide braking system controller

Flange lubrication (provision) & Resilient wheels

Truck side skirting & Undercarriage coatings
Noise and vibration mitigation measures, LRVs

- Generalized design philosophy
- Minimization of un-sprung masses
- Low-stiffness, resilient primary suspension
- Provisional features for noise and vibration isolation
- Auxiliary equipment noise reduction through use of: roof shrouding, state-of-the-art fan blade designs for HVAC, vibration isolation from carbody structure
Noise reducing wheel designs aid high speed systems

Low Noise
SPL – wheel = 105 dBA
SPL – track = 109 dBA

Classic
SPL – wheel = 111 dBA
SPL – track = 109 dBA
Wheel damping devices are also deployed.
Perhaps more interaction between truck and track up-front?

• Truck and track designer seldom speak directly
• Insert a feedback mechanism for truck/track designer(s) during analysis and testing phases of project
• Wheel and rail design as a system
• Current process is functional and works well – however can be improved with systems approach