RSAC – Distributed Power (DP) Train Braking Modernization Task Group

DP Task Group Charter

Opportunity Statement:

Identify potential modifications of train brake equipment and brake-related processes and procedures to improve train braking effectiveness employing technological advancements of a DP system.

Description:

The Task Group (TG) will review the braking effectiveness of trains with different combinations of DP and various train lengths to determine if braking effectiveness can be improved.

Revised Objectives:

1. Perform study/analysis of conventional vs. distributed power train operations:
   a. Evaluate train braking effectiveness of conventional vs. DP trains.
   b. Research the effect of DP position in train consist.
   c. Evaluate DP impact on drawbar forces.
   d. Evaluate asynchronous DP operation.
2. LXA impact on Comm Loss.
3. How DP train braking measures against ECP (ref. AAR statement from 2018).
4. Any other issues related to train brake performance associated with DP.
5. Communicate findings/recommendations with OP TG.
6. Generate preliminary report by March 1st, 2024.

Background:

On May 8, 2015, the Pipeline and Hazardous Materials Safety Administration (PHMSA) published a final rule (HM-251) which, among other items, defined “high hazard flammable train” (HHFT) and a “high-hazard flammable unit train” (HHFUT) HM-251 also required HHFUTs transporting at least one flammable liquid classified as a Packing Group (PG) I material be operated with an ECP braking system by January 1, 2021, and all other HHFUTs be operated with an ECP braking system by May 1, 2023. 80 FR 26644. On September 25, 2018, PHMSA repealed the HM-251 final rule based on the mandate of Section 7311of the FAST Act (requiring a determination of whether the rule’s brake requirements were justified based on whether the final RIA demonstrated that the benefits exceeded the costs. 83 FR 48393. On February 21, 2023, the Secretary of Transportation announced that the Department would pursue further rulemaking on HHFTs and ECP brakes.

TG Team Members:

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Objective 1a: Train Braking Effectiveness: Conventional vs. DP Trains – Conclusions

Based on simulation studies at one Class I railway for a 200-car train in head-end and DP (75% length placement) configurations compared to conventional head end only power, the DP Task Group determined the following DP benefits in key brake performance areas:

- Full brake set - 2.8x faster
- Recovery time - 3.6x faster
- Max brake pipe gradient - 9.6x less
  - Measured after release and at steady state (0.25 PSI DP vs 2.4 PSI Conventional)
  - Simulation assumed a 2.0 lb leak

*Preliminary results from the FRA long train study also show performance improvements.

Objective 1b: DP Position Effect In Train Consists – Conclusions

DP Task Group determined:

- ~ 66% of Brake Pipe for Head/Mid operation is typical.

- Trailing tonnage consist distribution defines DP consist(s) location in consist.

- Segmentation: 7,400' – 10,000' predicated on DP Comm system type, brake pipe air propagation requirements and route characteristics

- Interchange of the DP trains are coordinated between handling railroads to ensure compliance with the subject railroads' operating rules and train makeup guidelines.

- Maximum braking effectiveness is achieved through compliance with all the best practices, such as, train make-up, compliance with the OP rules, etc.

Objective 1c: DP Impact on Coupler Forces – Conclusions

DP Task Group determined:

- Doubled bulk trains (coal in study) stay below maximum E-type coupler capacity in all scenarios
- DP consist position ensures doubled bulk and single train forces can be maintained to equivalent levels
- Cresting or traversing on undulating track may generate higher in train forces in doubled trains

Objective 1d: Asynchronous DP Operation – Conclusions

DP Task Group determined:

- Train simulations suggest reduction in in-train forces when asynchronous mode of DP operation is utilized decreasing potential for UDE/break-in-two events.

- Asynchronous mode of DP operation helps control the train in a manner that allows consistent control of the train in various challenging terrain scenarios thereby avoiding the need to use the automatic air brake in some cases.

- Locomotive operator additional task to manually control DP consists is minimized as EM systems control the mode of operation automatically.

Objective 2: LXA DP Feature Impact on Communication Losses – Conclusions

DP Task Group determined:

- LXA DP radio diversity reduces DP communication losses by 50%.
- Utilization of ITCM network for DP communications further reduces comm losses, between 45% to ~90%.
- Improved DP communications (with LXA DP) between the DP Lead and DP Remote leads to improved train braking.

Objective 3: Train Braking Effectiveness: DP vs. ECP – Conclusions

DP Task Group determined:

- Train braking in emergency is similar between Radio DP and ECP
- DP adds a source of air supply
- ECP adds the following benefits
    - Enhanced service braking performance
    - Train brake condition monitoring

Open Discussion and Questions