CHAPTER 2
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Unit 8 Automatic Train Supervision

- ATS Functions
- ATS User
- CBTC Train Identification and Train Tracking
- Train Routing
- Schedule/Headway Regulation
- Energy Optimization
- Station Stop Functions
- Skip Station Stop

Introduction

- The Automatic Train Supervision (ATS) system is commonly integrated within most of the CBTC solutions.
  - Its main task is to act as the interface between the operator and the system, managing the traffic according to the specific regulation criteria(Fig.8.1).
  - Other tasks may include the event and alarm management as well as acting as the interface with external systems.

8.1 ATS Functions

- General, If specified by the authority having jurisdiction, a CBTC may interface to, *or be integrated with*, an ATS system.
- Under such circumstances, and to the extent specified by the authority having jurisdiction, CBTC-related ATS functions shall be implemented as defined in this article in order to benefit from the characteristics of a CBTC system namely:
  - Availability of train location information to a high precision, independent of track and circuits.
  - Availability of continuous wayside-to-train and train-to-wayside data communications link.
  - Availability of trainborne and wayside *data processing capabilities*.

8.2 ATS User

- *Interface Each ATS* user interface shall display all information and implement all control actions, as defined in this article, within acceptable latencies as specified by the authority having jurisdiction.
- The ATS user shall be able to override any automated CBTC related ATS functions defined in this article. Control action validation shall be provided for any safety related function and functions whose inadvertent implementation could have an adverse operational impact, as defined by the authority having jurisdiction.

8.3 CBTC Train Identification and Train Tracking

- Each CBTC-equipped train operating within CBTC territory shall be assigned a train identification. This train identification shall indicate the type of train and other pertinent information about the train.
- An ATS system shall have the capability to automatically track, maintain records of, *and display on the ATS user interface* the locations, identities, train schedule, and other pertinent data for all CBTC-equipped trains operating in the CBTC territory.
  - The front and rear position of trains shall be tracked based on CBTC train location reports, and displayed on the ATS user interface.
  - Variations in train length may be displayed either proportionally or as a standard length icon supplemented by textual train length data.

8.4 Train Routing

- **An ATS system shall have the capability to permit CBTC-equipped trains** *operating in CBTC territory* **to be manually and automatically routed based on CBTC train location reports and in accordance with the train service data, predefined routing rules, and any ATS user directed service strategy.**
  - **Automatic routing shall facilitate the proper merging and diverging of trains at junctions, turnback of trains, the put-in and lay-up of trains from/to storage areas and, where applicable, the rerouting of trains in response to service disruptions and/or planned outages.**
  - **Train routes shall be indicated on the ATS user interface, and may also be indicated to the train operator and/or conductor on their displays, as specified by the authority having jurisdiction.**

8.4 Train Routing

- An ATS system shall also include a means to control and limit movement authorities of CBTC-equipped trains *operating in CBTC territory*.
  - CBTC movement authority limits shall be capable of being displayed on the ATS user interface, and any uncommanded reductions of authority limits shall be alarmed.
  - Movement authority limits may also be indicated to the train operator and/or conductor on their displays, as specified by the authority having jurisdiction.

8.5 Schedule/Headway Regulation

- An ATS system shall have the capability to automatically monitor and regulate the performance of *CBTC equipped trains operating in CBTC territory*, in relation to schedule and/or headway adherence.
- An ATS system shall include an automatic dispatching function (based on train identities, CBTC train location reports, scheduled and actual headways between trains, and service strategies implemented by authorized ATS users).

8.5 Schedule/Headway Regulation

- Schedule and headway regulation for CBTC-equipped trains shall be *by means of* dwell time variance (including train holds), and control of run-times between stations (e.g. through adjustments to train acceleration and service brake rates, and cruise speeds), as specified by the authority having jurisdiction.
  - The desired *station departure time* and desired speed profile between stations shall be indicated to the train operator and/or conductor on their displays and, *when operating in ATO mode*, shall be implemented automatically by a CBTC system using the automatic speed regulation function.
- An ATS system may provide the capability to adjust the train service braking profiles for CBTC-equipped trains (e.g. in response to wet rail conditions).
  - A CBTC system shall coordinate implementation of requested changes in service braking profiles to avoid conditions that would result in an emergency brake application.

8.6 Energy Optimization

- An ATS system may have the capability to implement energy optimization algorithms for CBTC equipped trains through the real-time control and coordination of train acceleration, train coasting, and train braking.
- The priority given to energy optimization versus schedule/headway regulation shall be as specified by the authority having jurisdiction.

8.7 Station Stop Functions

- **Stop Train at Next Station**
  - An ATS system may include the means to direct *a single CBTC-equipped train or a group of CBTC-equipped trains* to stop at the next station, even if the train is scheduled to bypassing that station.
  - A CBTC system shall indicate the ATS train stop information to the train operator and conductor on their displays.
  - In ATO mode, a CBTC-equipped train shall automatically stop at the next station.

8.7 Station Stop Functions

- **Hold Train at Station**
  - An ATS system may include facilities to hold (and subsequently release) a CBTC equipped train at a station, and to inhibit automatic train door opening.
  - A CBTC system shall indicate the train hold information to the train operator and conductor on their displays, and shall prevent a CBTC-equipped train from departing the station in ATO mode.

8.8 Skip Station Stop

- An ATS system may include facilities to direct *a CBTC-equipped train or group of CBTC-equipped trains* to pass through *a station or group of stations* without stopping.
- A CBTC system shall indicate the skip station information to the train operator and conductor on their displays.

Homework

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