



VarWMS

Variable weather station

About VarWMS

Determination of weather data, which can be used by control units, is essential for railway systems and their protection and control. We know that wind is already measured in tunnels (spread of hazardous substances) and marshalling yards (dynamical process calculations), for example, and temperatures are measured to control switch (point) heatings.

The variable weather station (VarWMS) is designed to provide other relevant weather data or conditions directly or indirectly (derived from sensor values) so that they can be used in control units in railway systems. The use of VarWMS is motivated by and a result of various weather phenomena that, without doubt, have an effect on the operation of railway systems but cannot be measured directly in the rough environment of the railway system.

Determination of weather conditions with integrated weather model

Rail track condition

The condition of the rail tracks is described either in categories — dry, wet or humid or in form of a numerical friction coefficient. It considerably influences traction, braking effects and resistance to rolling of wheel/rail systems.

Fog, dew and rime

Even if it is not raining, rail tracks can get wet due to dew, for example. In contrast, dry and warm air with water absorptive capacity prevents formation of dew. In case of frost and high water saturation of the air (fog), rime can be produced by deposition, which results in dry rail tracks.

Drying, sublimation

Rail tracks coated with precipitation are either dry (powder snow, ice, soft rime) or wet (rain, thawing snow, dew). Thawing causes a change of the rail track conditions from dry to wet after some time. Drying of a water film caused by precipitation changes the rail track condition from wet to dry (or humid).

Ice formation

Not all types of precipitation or frost are the same. Rain, hail and snow of different textures have different effects on movable parts of railway tracks (point blades, point machine) depending on other weather factors, such as air temperature, surface temperature, water absorptive capacity of the air, water film formation, drifts.

Sensors

The weather station VarWMS is equipped with various weather sensors to obtain primary weather data. There are sensors for wind direction, wind speed, surface temperature, air temperature, relative humidity and precipitation amounts. The primary weather data is used to calculate secondary (derived) weather data by means of an internal weather model.

Use cases

Marshalling yards

Sequence control systems make dynamical calculations to optimize the sequence of processes (efficiency) and to avoid overrunning collisions (shunting quality); they use weather data such as wind speed and wind direction to determine wind resistances in free-wheel processes.

The free running in curved tracks is determined by friction between wheel and rail. Previously, the friction conditions have been determined and entered in the sequence control system by means of (sliding) average values not subject to changes in weather or based on the operating personnel's subjective observation. VarWMS allows to determine the track condition objectively and to promptly transmit it to the sequence control system. Mistakes in the sequence of processes (wrong running due to safety points) are reduced, and the shunting quality improves.

Sanding systems

Automatic sanding systems can be better controlled when the track condition is considered to suit current needs. In the end, less sand is used. Safety is maintained or is even improved by excluding subjective influences.

Rail track lubrication systems

Rail track lubrications systems, which are often designed to compromise between traction, environment protection and efficient noise prevention, can be optimized by including the track condition in different weathers in the decisions of the control unit. If tracks are humid and wet, there is a natural lubrication effect that reduces noise (creaking and squeaking in the curved track) so that smaller amounts of lubricants are sufficient. A reduced use of lubricants protects your budget and the environment.

Switch (point) heating

Control units for switch heatings often analyze the surface temperature of the rack only to obtain control information for connected (mostly electrical) heatings. If they are able to detect adverse weather conditions, such as snowfall or wet snow or the risk of snow drifts without or with minor frost, the switch heating can be switched on time so that ice resulting from compacted wet snow does not block the point blades. This guarantees extra availability.

Frost is not a problem for the correct function of the points; ice, however, can be. If it is possible to distinguish ice formation and dry frost, this results in a considerable energy saving potential.



Short company overview of AIS Automation Dresden GmbH

For more than 25 years AIS Automation Dresden GmbH has been supplying software solutions for the traffic and railway technology. Multiple marshalling and shunting yards have been equipped with the rail brake control system (VarGBS). We will support you over the entire life cycle – from specification, via installation up to customer service.

135 experienced and committed engineers create, develop and install our software solutions in close collaboration with you.