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Inland Transport Committee

Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (ADN Safety Committee)

Twenty-third session
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Operation of Inland AIS stations during loading, unloading and gas-freeing of ADN tank vessels

Transmitted by the Central Commission for the Navigation of the Rhine (CCNR)

1. Inland AIS (Automatic Identification System) is a system coming from maritime shipping which automatically transmits to other vessels the position and further safety-relevant information of a vessel. Inland ECDIS (Electronic Chart Display and Information System) is a system which displays navigation-relevant information on an electronically displayed navigational inland chart. If all vessels navigating on an inland waterway are equipped with Inland AIS and Inland ECDIS, every master will see a graphical representation of all vessels on his electronic navigational inland chart, plus their most important safety-relevant information. Investigations have shown that over 90 % of the inland vessels on the Rhine are equipped with Inland AIS.

2. The information transmitted by Inland AIS stations must be complete and reliable in order that masters can use them to navigate their vessels. Incomplete or wrong information can lead to misinterpretations of the situation on the water and, consequently, to wrong decisions taken by the master. Therefore it ought to be ensured that, with the exception of very few small vessels, on principle every vessel and convoy is equipped with Inland AIS stations. In addition, it ought to be ensured that the Inland AIS is used, that the station is constantly in operation and that the transmitted information is correct. Currently CCNR is discussing the mandatory introduction of Inland AIS, which could enter into force in the near future.

3. Inland AIS stations are permanently installed in the wheelhouse. They consist of a positioning module (GPS receiver) and a data radio transmitter and receiver. Inland AIS data radio modules operate with two power levels: either 12.5 Watt (W) or less (1 or 2 W, depending on the station). These levels determine the station's radio range. Switching the station from the 12.5 W level down to the lower power level is a complex procedure, so that it is recommendable either to switch off the AIS station or to operate it at 12.5 W.

4. A shielded cable connects the Inland AIS station to its antenna. The antenna is typically mounted to the wheelhouse or to the bow. The requirements for the antenna position are laid down as follows in article 4 (Antenna installation) of the Guidelines on the Installation of the Inland Automatic Identification System:

"4. Antenna installation
The use of certified antennas, type approved with the Inland AIS station, are mandatory.
Antennas not included in the type approval need a declaration of conformity to the type approval certificate, delivered by the manufacturer of the type approved Inland AIS station.

4.1 AIS VHF Antenna

The AIS VHF antenna should be installed in such a way that the potential interference with other high-power energy sources, such as radar and other VHF antennas, is as low as technically and physically possible. The VHF antenna should be placed in a vertical position, but it must be possible to lower the antenna temporarily for passing bridges and other objects with a reduced height.

Interferences to the ship's VHF radiotelephone shall be avoided; attention should be paid to the location and installation of the various antennas, in order to support the antenna characteristics in the best possible way.

The AIS VHF antenna must have an omni-directional characteristic and a vertical polarisation. Special attention should be paid to the installation on a movable antenna mast.

The AIS VHF antenna should be placed in an elevated position, as free standing as possible, with maximum horizontal distance from objects made of conductive materials.

The antenna should not be installed close to any large vertical obstruction. The AIS VHF antenna should have a visible horizon of 360°.

The AIS VHF antenna should be installed with maximum horizontal distance from interfering high-power energy sources, such as radar, and if possible out of the way of their transmitting beam.

The distance between the Inland AIS VHF antenna and other VHF antennas, e.g. for VHF voice communication, shall be as large as possible to avoid interference between the antennas."

5. According to the provisions of the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), electrical installations installed in the wheelhouse of tank vessels have to be (at least) of the type "limited explosion risk" during loading, unloading and gas-freeing; see articles 9.3.x ADN; this means that only those electrical installations may be operated which during normal operation do not emit any sparks and do not have surface temperatures above the required temperature class (200 °C). Exceptions cover radiotelephone installations, mobile and fixed telephone installations, and spaces under overpressure. The ADN does not explicitly mention AIS stations. There are no corresponding limitations for other types of vessels regarding the operation of electrical installations which are operated within the wheelhouse.

6. On dry cargo vessels, however, according to para. 7.1.3.70.2 no part of antennas for radiotelephones shall be located within 2 m from substances or articles of Class 1. In this connection the transitional provisions according to para. 1.6.7.2.2.2 are relevant in respect of para. 9.3.1.52.1 e) and 9.3.3.52.1 e), as well as 9.3.1, 9.3.2 and 9.3.3. Moreover, the rules for construction for tank vessels of type G, C and N apply, in particular para. 9.3.1.52.3, 9.3.2.52.3 and 9.3.3.52.3. According to the Regional Arrangement concerning the Radiotelephone Service on Inland Waterways, radiotelephone installations, which according to para. 9.3.x.52.3 may be operated in the wheelhouse during loading, unloading and gas-freeing, have an output of up to 25W.

7. From the nautical point of view a difference has to be made between:
   a) Loading and unloading
      i) in harbours: Switching off the AIS station is uncritical;
      ii) at quay walls / on waters adjacent to the fairway: Switching off the AIS station may possibly be critical;
   b) Gas-freeing when the vessel is under way: Switching off the AIS station is very critical.

8. According to the provisions of CEVNI (European Code for Inland Waterways) and the Police Regulations for the Navigation of the Rhine it is mandatory for vessels under way to communicate via radiotelephone information which is relevant for the safety of the navigation. This obligation applies also during gas-freeing while the vessel is under way.

9. Paragraphs 4.8.1, 4.8.2.2 and 4.8.4 of ISGOTT (International Safety Guide for Oil Tankers and Terminals) determine that all electrical installations have to be switched off, with the exception of small radiotelephones with an output below 1 W.

10. Consequently, the mandatory introduction of Inland AIS and the obligation to have the station always switched on, i.e. even during loading, unloading and gas-freeing, might conflict with the ADN.

11. The CCNR working group RIS discussed this issue during its session on 5 and 6 March 2013. The working group proposes to change the ADN to the end that Inland AIS stations may constantly be switched on, even if they are not explosion-protected, because they are quite similar to radiotelephone installations which are permitted:

- The Inland AIS station is a radiotelephone intended for the automatic exchange of nautical data. Therefore, it is not a radiotelephone installation although it is based on the same technological principle.
- It uses the same frequency range.
- As stipulated in para. 9.3.3.52.3 b) number ii, it is installed in the wheelhouse.
- It can be operated at two power levels, 12.5 W and 1 or 2 W, according to the type. According to para. 7.1.4.51 of the ADN the prohibition to operate radio transmitters does not apply to VHF transmitters provided the output of the VHF transmitter does not exceed 25 W and no part of its antenna is located at a distance less than 2 m from the substances or articles mentioned above (i.e. of class 1).
- According to para. 7.1.3.70.2 of the ADN no part of antennas for radiotelephones shall be located within 2 m from substances or articles of Class 1. The antenna of the Inland AIS station is generally installed near the wheelhouse and thus outside the distance of 2 m from the dangerous goods.

12. In view of the technical expertise of the Physikalisch-Technische Bundesanstalt (PTB), CCNR asked PTB to give a statement on this issue. In its answer dated 26 June (see annex) PTB stated: "*Since under the current regulations of the ADN it is permissible for radio communication equipment to remain switched on during the loading, unloading and gas-freeing of vessels carrying hazardous materials, it is logical that this permission should also be extended to AIS equipment, which will after all be vital for safe navigation in future. As such, there is no reason not to approve the draft amendment to the ADN Regulations."*

13. Accordingly, CCNR has the intention to request the amendment of paragraphs 9.3.1.52.3 b) number ii, 9.3.2.52.3 b) number ii and 9.3.3.52.3 b) number ii at the ADN Safety Committee in January 2014. These paragraphs could be amended as follows:

"b) This provision does not apply to:

(i) lighting installations in accommodation with the exception of switches near entrances to accommodation;

(ii) radio telephone installations [and Inland AIS stations] [as well as stations intended for the automatic exchange of nautical data by radio] in accommodation and wheelhouses;"

14. CCNR kindly asks the ADN Safety Committee to answer the following questions:

a) Could the ADN Safety Committee principally agree on treating Inland AIS stations and their antennas like radiotelephones which thus may remain switched on also during loading, unloading and gas-freeing of vessels which carry dangerous goods?

b) Which additional technical prerequisites would possibly have to be met for Inland AIS stations to allow for their permanent operation?

c) Do you have any additional remarks concerning the proposal for an amendment of the ADN according to para. 13?

15. In order to discuss this topic during the session of the CCNR working group RIS it would be very helpful to receive your answer until September 2013. Thus the CCNR could prepare its amendment proposal for the session of the ADN Safety Committee in January 2014.

Annex

Physikalisch-Technische Bundesanstalt
Braunschweig and Berlin

Certification authority, certification sector for explosion protection

Physikalisch-Technische Bundesanstalt, Postfach 33 45, 38023 Braunschweig

Central Commission for the Navigation of the Rhine
Mr Gernot Pauli
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2 Place de la République
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Your reference:	Gernot Pauli
Your communication dated:	10 June 2013
Our reference:	3.6-2131/13-Jo
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Inland AIS equipment and ADN Annexed Regulations

Dear Mr Pauli,

In response to the questions raised in your communication dated 10 June 2013, our position is as follows:

In terms of safety considerations, Inland AIS equipment is comparable with radio communication systems and telephone systems. According to the available specifications, the maximum HF power of the AIS equipment is 12.5 W, and is thus lower than that of the radio communication systems. Since it is permissible under the current regulations of the Annexed Regulations to ADN for radio communication equipment to remain switched on during the loading, unloading and gas-freeing of vessels carrying hazardous materials, it is logical that this permission should also be extended to AIS equipment, which will after all be vital for safe navigation in future. As such, there is no reason not to approve the draft amendment to the Annexed Regulations to ADN.

In our view, however, it must be considered retroactively, whether the ignition hazard arising from HF radiation emitted in explosion-hazard areas has already been taken into consideration from a safety perspective during the licensing process for radio communication equipment with power ratings of up to 25 W. The current regulations (applicable to explosion-hazard areas on land) are EN 60079-0:2012, section 6.6 of which contains regulations for HF radiation (in explosion-hazard areas):

6.6.1 High-frequency radiation sources

The limit value for power rating in relation to high frequencies (9 kHz to 60 GHz) for continuous radiation, and for pulsed radiation where the duration of impulses exceeds ignition induction time, must not exceed the values listed in Table 4. Programmable settings, or software adjustments by the user, are not permitted.

Table 4 – High-frequency signals – Output radiation power rating

Equipment in group	Output radiation power rating W	Ignition induction time µs
Group I	6	200
Group IIA	6	100
Group IIB	3.5	80
Group IIC	2	20
Group III	6	200

A further source of information is VDE 0848:2001, Safety in Electrical, Magnetic and Electromagnetic Fields, Part 5: Explosion Protection, here in particular section 4.4.

4.4.2 Continuous high-frequency radiation sources

Ignition as a result of continuous high-frequency discharge is not to be expected if the maximum active power that can be measured at the receiving aerial, averaged over the ignition induction time, does not exceed the ignition limit value P_{zg} specified in Table 2 (see [28], [29]).

Table 2 – Ignition limit values at the receiving aerial for continuous high-frequency sources

Explosion Class under DIN EN 50014 (VDE 0170/0171 part 1)	Ignition limit value of active power P_{zg}
IIA	6 W, averaged over 100 µs (see note)
IIB	4 W, averaged over 100 µs (see note)
IIC	2 W, averaged over 20 µs (see note)
NOTE: The communication must extend over the period of the specified ignition induction time, resulting in a corresponding flattening of the power curve**.**	

It is presumed here that the antenna is not placed inside the explosion-hazard area, and "a high-frequency discharge capable of producing ignition is not to be expected if the maximum active power that can be measured at the receiving aerial does not exceed the values in the table". The extent of the power measurable at the receiving aerial is dependent on many factors, particularly on the distance between a potential receiving aerial from the antenna, on the geometry of the receiving aerial, on the field strength at the receiving location, etc.

Without detailed knowledge of the specific conditions on the vessels, it is hardly possible to make a conclusive statement, as at least the emitted HF power rating exceeds the limit values in the tables (which also vary in value for class IIB). If at the time (during the licensing process for radio communication equipment up to 25 W) a safety analysis was performed for the conditions on vessels carrying hazardous materials, it should be possible today to consider the operation of AIS equipment to be unproblematic.

Yours sincerely,
p.p.

Dr-Ing. U. Johannsmeyer

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