

Focus on IFA's work

Edition 7/2014

617.0-IFA:638.1

Are track welders exposed to PAHs?

Problem

During the maintenance and laying of railway tracks, rail joints often have to be welded. Before the welding process proper, the rail joints are pre-heated with a torch to roughly 200 to 300°C. This gives rise to the question whether polycyclic aromatic hydrocarbons (PAHs) or 2-naphthylamine are released during the heating and subsequent welding of the rails on wooden sleepers impregnated with hard coal tar pitch. Some PAHs such as benzo[a]pyrene (BaP) and 2-naphthylamine are classified as carcinogenic substances.

Since hardly any valid exposure data were available, it was decided to check in connection with a judicial enquiry into an occupational disease whether welders in track construction are exposed to PAHs during their working life.

Activities

In two series of measurements, the work process of welding rail joints was simulated by arc welding with low-hydrogen electrodes. All the welding work was performed on old sleepers (roughly 25 to 30 years old).

The first series of measurements took place on a track construction site at a preserved railway. In the second series of measurements, a track construction site had to be artificially created in order to replicate a particular situation in points and crossing construction (twin sleeper).



The welding of rail joints

By using recognized measuring processes, 2-naphthylamine and 17 different PAHs were measured on persons (welders) and at a static measuring point (at a height of about 1 metre about 1.5 metres from the emission source).

The measurements covered the heating of the rail joints, the welding process and the brief torching of a sleeper as a worst case simulation. In addition, the sleepers themselves were analysed for their PAH content.

Results and Application

The concentrations of roughly 500 µg/m³ of benzo[a]pyrene found in the railway sleepers are typical of wood impregnated with hard coal tar products (creosote or carbolineum).

The exposure measurements during welding work on rails laid on such sleepers showed that PAH exposure cannot be excluded. 2-Naphthylamine was not detected, however.

On the welders themselves, concentrations of 0.28 to 1.5 µg/m³ were found for benzo[a]pyrene serving as the guide substance. The high value arose in extreme conditions (torching the sleepers).

On average, exposure based on all measurement findings should be about 0.3 to 0.4 µg/m³ and is thus always below the old technical guide concentration (TRK) of 2 µg/m³ for benzo[a]pyrene.

For the calculation of BaP years (see BK-Report 2/2013), we recommend assuming a concentration of max. 0.4 µg/m³ and an exposure share of 5/8, as welding (including preheating) was performed for a maximum of 4 to 5 hours per shift. The rest of the time was spent with equipping and grinding.

Area of Application

Occupational disease experts

Additional Information

- „BaP-Jahre“ – Hinweise der DGUV zur Ermittlung der Benzo[a]pyren-Dosis (BaP-Jahre) für die Berufskrankheiten Nummern 4113 und 4114 (BK-Report 2/2013). Hrsg.: Deutsche Gesetzliche Unfallversicherung, Berlin 2013
www.dguv.de/webcode/d647307

Expert Assistance

IFA, Division 2: Chemical and biological hazards

Literature Requests

IFA, Central Division