

## Next Generation Underground in Hamburg

The next generation of trains for the metro and underground system in Hamburg, Germany will rely on a fully stainless steel design. Hamburger Hochbahn, the operator of the network, has ordered 27 of the DT 5 models for delivery between 2009 and 2013. The company has an option to purchase another 40.

Hamburger Hochbahn's new DT-5 trains will replace existing model known as the DT-3] which has been in operation on the network since the mid 1960s. Just like its predecessor DT-2, the DT-3 also utilises stainless steel in its construction. "We are happy to see that with stainless steel we unite positive long term experience on one hand with a future-oriented customer satisfaction approach on the other," said Jörg Petersen, who is responsible for the maintenance of Hamburger Hochbahn's fleet.

When they presented the mock-up of the new model to the general public in July 2008 Hamburger Hochbahn specifically highlighted responsible material selection as a key element in their approach to sustainable public transport. The company believes that the environmental product declaration for the complete vehicle design, including almost 95% recyclable materials, ensures sustainable resource saving.

Petersen knows that sustainability and cost saving are two sides of the same coin medal. "Our rolling stock is designed for a service life of 45 years. Hence durability considerations and easy maintenance are key factors of the life-cycle cost."

Hamburg, 50 km inland on the estuary of the river Elbe, is Germany's largest harbour. The elevated halide content of a coastal North Sea climate and the presence of sulphur dioxide and other corrosive exhaust gases from ships led Hamburger Hochbahn to select proven

austenitic chromium nickel stainless steel for the largely unpainted skin of the railcar body. "The external surfaces in stainless steel are easy to clean and make expensive painting operation redundant," says Petersen.

"The removal of graffiti accounts for a considerable percentage of the body maintenance cost," Petersen adds. Chemically dissolving graffiti on painted surfaces degrades the coatings over time. Graffiti does not adhere well to polished and brushed stainless steel making its removal easier. The absence of a coating also means that the blank metallic surface does not undergo any colour changes due to UV-radiation. Repainting faded surfaces is a thing of the past.

The work-hardened stainless steel type AISI 301 LN (EN 1.4318) was chosen for its strength. Although the specific weight of stainless is not particularly low (7.9 kg/m<sup>3</sup>), the wall thickness could be kept to a minimum (1.5 to 2 mm) ensuring that the fabricated components are in the same weight range as their light-metal counterparts. Superior fatigue strength makes stainless a good choice in urban public transport, where short cycles of acceleration and deceleration make operating conditions particularly demanding.



*Positive long-term experience with the DT-3 ensured Hamburger Hochbahn opted for stainless steel in its next generation of trains (Photo: Hamburger Hochbahn AG)*

The front of the train units, where more complex forming operations are required, is fabricated from grade AISI 304 (EN 1.4301) with 18% chromium and 9% nickel content. Due to the outstanding forming potential of this stainless type the front could be made in a seamless design.



*Mock-up of the next generation of Hamburg's metro cars (Photo: Hamburger Hochbahn AG)*

"Contact with our passengers taught us that visible stainless steel has a lasting favourable effect on our image," says Günter Elste, CEO of Hamburger Hochbahn. Stainless steel elicits a number of positive associations including hygiene, safety, durability, elegance and value. People are more willing to take public transport if the trains are comfortable and attractive. Perceived safety and cleanliness are high priorities.

The design of these coaches is provided by Linke Haufman Busch of Germany (LHB). The LHB design uses austenitic SS for the roof and trough-floor where the chances of corrosion are high. Railways also have plans to go for unpainted austenitic stainless steel shells in the near future.