New corrosion resistant steel grade for marine applications

João Martins, Head of Engineering and Promotion, ArcelorMittal Commercial RPS S.à r.l., Luxembourg

AMLoCor offers a significant reduction of the corrosion rates in the low water zone (LWZ) and in the permanent immersion zone (PIZ), which is normally the location of the maximum bending moments, and consequently the highest steel stresses. This new steel grade is the solution to address one of the major concerns of designers and port authorities: durability of marine structures like quay walls, breakwaters and jetties.

Eurocode 3 Part 5 contains reference tables with typical corrosion rates valid for standard structural steel in northern European countries. In-situ tests during the last two decades in Northern European ports have proven that, in comparison to standard structural steel in the critical zones, the loss of steel thickness of AMLoCor is reduced by a factor 3 in the PIZ and a factor 5 in the LWZ.

The recipe to achieve these extraordinary properties is a special chemical composition which contains specific alloys. The final formula has been improved based on the results of several research and development projects. AMLoCor leads to considerable savings in steel weight, in the case of high corrosion rates of regular structural steel in the permanent immersion zone. Cathodic protection or coatings can be used to increase the service life of the sheet pile structure, and are compatible with this new steel grade. However, AMLoCor will in many cases yield the most cost effective solution in the long-term, without any additional steel protection. AMLoCor also protects steel from accelerated low water corrosion, which is related to biological activity enhancing degradation of steel in the LWZ.

The mechanical properties of AMLoCor steel are fully equivalent to standard piling grades, so that structural resistance can be determined according to all relevant design codes used for steel sheet piling structures, like EN 1993-5:2007 in European countries.

An important feature of any new development is the drivability. Hence, a driving test was performed in Denmark. Several sections in steel grades S 355 GP and AMLoCor Blue 355 were driven into very hard soils with some boulders. They were monitored during driving, then pulled out and inspected. This driving test demonstrated that the behavior of AMLoCor sheet piles driven into hard soil is at least as good as standard structural steel sheet piles.

The manufacturing process had also to be adapted in order to cast the steel and produce the beam blanks used for the rolling of the first AZ sheet pile sections. AZ sections are now available with yield strength up to 390 megapascal.

The first project with AMLoCor sheet piles is a quay wall in the southern part of the UK, in the Port of Shoreham. It consists of an anchored wall with 16.0 meter long AZ 37-700 in AMLoCor Blue 355. Some sheets are equipped with extra elements to enable monitoring of the residual thickness during the first five years, and to compare these results to two reference sheet piles in S 355 GP.

AMLoCor is the new low corrosion steel grade that will undoubtedly revolutionise the design of port structures in the future.

AMLoCor is the new low corrosion steel grade that will undoubtedly revolutionise the design of port structures in the future.

ArcelorMittal
The largest manufacturer of hot rolled steel sheet piles worldwide. The experienced engineers of the sales and technical departments can assist all project stakeholders towards cost effective and sustainable foundation solutions for permanent and temporary applications. ArcelorMittal develops innovative products and delivers high quality steel sheet piles produced from recycled steel.

ENQUIRIES
ArcelorMittal Commercial RPS S.à r.l.
Sheet Piling, 66, rue de Luxembourg, L-4221 Esch-sur-Alzette
Email: sheetpiling@arcelormittal.com Web: www.arcelormittal.com/shaepiling