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Application report: wireless radio probes for measuring work at pylons.

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Dr. Rolf Arnold, graduated Mineralogist and Crystallographer, received his doctorate in Thermodynamics and Structural Analysis. During 1977 and 1990 he was responsible for the co-ordinating office of corrosion protection of the GDR's Chemical Industry. Since then he manages a company concerned with corrosion and building protection and is subsidiary manager of the Chemical Industry Erlangen GmbH for East Germany and EVU's in Hungry.
As an expert Dr. Arnold works in the field of corrosion and steel fire-protection and is a member of the Bundesausschuss für Farbe und Sachwertschutz e.V. (German Federal Committee for Paint and Protection of Physical. Assets).

Using state-of-the-art corrosion protection measurement technology in quality management and the renovation and monitoring of pylons and large steel constructions

How using wireless measuring probes for coating thickness measurements increases the safety of renovating steel constructions.


Pylon „Elbekreuzung" with a warning paint, height: 228 metres.


. World novelty: the miniature wireless radio probe QNix® allows for a new problem-free and safe way of taking coating thickness measurements, featuring wireless transmission of measurements.

Steel – a material with pros and cons

About 15 billion tons of crude steel have been manufactured word wide in the last 140 years. Its excellent physical characteristics make steel a most versatile material. With useful properties such as mechanical strength, malleability, formability and durability, to name a few, steel has proven a material best suited for the needs of the capital equipment industry. As such, 70 per cent of the production volume of steel is

used for constructing long-lasting buildings such as bridges, power generating plants, halls, transportation, machines and appliances.

All these advantages however are opposed by one undeniable disadvantage. Steel corrodes!
Fortunately, corrosion damage can be avoided by either alloying steel with various other elements (chromium, nickel and others) or by covering it in an organic or inorganic protective coating (paint, galvanising, powder lacquer). Such coatings are used in over 90 per cent of all cases.

Corrosion protection – a precaution against damage in the billions

The cost of corrosion protection is usually quite low. Especially when compared to the expected obsolescence of equipment or constructions and the cost of an operation shut down. In the US, for example, the total cost resulting from corrosion damage each year has been estimated to be equal to 4% of the US gross national product (515 billion US dollars) (Source: *Fraunhofer Institute for Manufacturing Technology, brochure 2804).*
In the scope of the conducted study, this amount includes - in some branches of industry - the primary corrosion damage (cost of general overhaul and continuous maintenance due to corrosion) as well as secondary damage (such as breaking of lattice masts and power outage caused by it) and the cost of the corrosion protection. In Germany, such costs amount to billions. 20 years ago the cost of corrosion damage has already been estimated at 70 billion Deutsche Mark (former German currency); or 4.5% of the Germany's gross national product of that time. Today, the cost is considerably higher. At 4% of Germany's current gross domestic product, the amount now reaches 70 billion Euros. (Source: *Flyer Corrosion Protection of the Fachhochschule Ostwestfalen, Iserlohn).*
Therefore, the issue of corrosion protection is of increasing importance to the industry. Numerous rules and regulations, such as DIN EN ISO 12944, support the constant effort to avoid and reduce corrosion damage.

Modern coating materials protect against corrosion.

To ensure passive corrosion protection organic coating materials are used. Inorganic coatings are mostly manufactured in a galvanizing process. It is the impermeability against affecting media of such coating materials that is the most important aspect of their various protective features.
Existing pores allow subsurface corrosion to spread and destroy the coating from underneath. Therefore, steel structures are layered with several coatings to protect the structure for a longer period of time. Careful selection of adequate coating materials and the quality of the coating process are of the utmost importance to the durability of the coated layers. To ensure the quality of a Duplex system for instance, the coating thickness of the galvanised layer and the organic coating on the steel underground have both to be measured in a controlled manner.
Here, the combined measuring mode of the QNix® 8500 measuring system from AUTOMATION Dr. Nix, Cologne offers a particularly convenient way of measurement. The zinc layer and the upper organic layer are being measured in one

single measuring process and then recorded. The coating thickness of both layers can then be analysed simultaneously.

Providing safety - standards for checking coating thickness

As the protection and safety of large steel constructions are of such importance, the DIN EN ISO 12944 Part 7 “Corrosion protection of steel structures by protective paint systems” regulates the execution and monitoring of coating work. The standard explicitly requires the checking of dry coating thickness with measuring procedures and methods that are in compliance with the EN ISO 2808:2007(D) as stated under item 6.3.

The standard includes: magnetic measurement methods based on the measurement of changes in the magnetic field as implemented by AUTOMATION Dr. Nix (item 5.5.6) and measurements with Hall sensors as well as eddy current measurement methods (item 5.5.8). In praxis, the ease of use and calibration are particular advantages for corrosion protection and coating thickness measurement gauges. Easy operation, a rugged construction and a design that ideally suites the gauge for everyday use are only a few of the important requirements for a reasonable application in the quality management of major projects.

Effective and unexceptional quality control using wireless measuring technologies

Corrosion protection coating of large steel constructions such as lattice masts and antennae can only be checked while climbing. Here, the QNix® Keyless-gauges and the new modular measuring system QNix® 8500 prove of particular value. Their very small measuring probes are equipped with a hand strap and allow free climbing with both hands, enabling the user to check the coating thickness of the object completely and effectively. The use of a small measuring probe such as the radio based miniaturised QNix® 8500 sat and QNix® Keyless enable the user to easily carry out his work particularly fast and conveniently in each situation. Even under difficult conditions as they occur on pylons, the work will be done in compliance with safety regulations and without any cables hindering the work. Determining coating thickness precisely and fast using the only thumb-sized and 30 grams light QNix® radio probe is an advance in the field of coating thickness measurement, which both facilitates work and improves quality control and operational safety considerably.

For additional information visit www.qnix.de