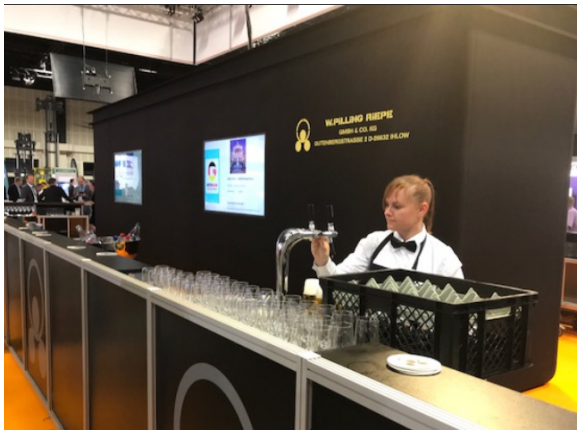
INTERGALVA 2018 Berlin

17-22 June 2018 | Berlin | 25th International Galvanizing Conference

Intergalva 2018 in Berlin

The big worldwide galvanizing conference Intergalva 2018 was performed at Estrel Hotel in Berlin – Europe's Largest Hotel, Congress and Entertainment Centre, with 1125 rooms and suites, four restaurants, three bars, a beer garden and a modern wellness & fitness area. This Intergalva had most participants ever, both in form of delegates and exhibitors. For me it was my 6:th Intergalva, and I think it was the best one, both in terms of presentations and exhibitions. For the people I spoke with it seems like most of them agree with me. The exhibition had a very smart layout, with a big bar in form of a kettle (of course hosted by Pilling!) in the centre of the room, and the other exhibitors arranged around them. The bar was never closed, so between the presentations it was possible to take a beer and look at football from the ongoing world championship on large screens.

Pilling Bar in the centre of the exhibition area.



To the right: Happy NG people at the Gala Dinner in Konzerthaus Berlin. Annette Hjelmare from NG Info office who worked at the conference as assistat to EGGA, Bjarne Khile and Johnny Teigmann from Duozink with their vifes Torild and Nina and Michael Steen from Progatec.

The conference started with a key note speaker, Lars Thomsen, who is an influential futurist and trends researcher. Thomsen consults for corporations, institutions and government bodies on the development of future strategies and business models. His speech was about the future and about the tipping point, i.e. the point at which a series of small changes or incidents becomes significant enough to cause a larger, more important change. His vision for the future in a ten year perspective, was that smart robots as assistants to people - both at work and in home - will be common. It may seem a bit strange today, but it was only 10 years since Apple launched I-phone 1, which was a revolution with all the possibilities in one small computer, today used by almost everyone, also small kids. After this inspiring start the galvanizing presentations took over. Below is a selection from them. If someone wants more information on some of the topics, feel free to contact me.

The galvanizing industry in Germany (M Huckshold, Industrieverband Feuerverzinken e.V.)

In 2017, around 1.9 million tonnes of steel were batch galvanized in Germany. 4800 employees are working in 147 galvanizing plants with a total 760 mill turnover. The kettle volume is 5,500 m^3 and the zinc consumption during 2017 was 110 000 tonnes. During the period from 2000 to 2018 the increase in tonnage has been 30 %, from 1.43 to 1.9 million ton per year. Among other things galvanized steels are used for design, for example in facades. A new interesting market is steel bridges, an initiative started with basic research work on cyclic load behaviour of galvanized steel and now aimed in expanding the use of batch galvanizing for highway bridges. The German galvanizing association was founded in 1958. It has 100 member companies and 11 employees.

Galvanized bridges in Japan (D. Ungermann, Dortmund University)

Total road length in Japan is more than 1 200 000 km and it is the sixth longest in the world. Because of the topographical feature of Japan there are a lot of bridges and tunnels and the number of bridges is well over 15 000. About one -third of these are steel bridges. As the weight of a steel bridge is lighter than a concrete bridge,

it is suitable for a relatively long span bridge. But a good corrosion protection is needed. The first galvanized bridge in Japan was built in 1963. Since then more than 1000 bridges have been built all over Japan. All hot dip galvanized bridges are still in good condition and it proves that hot dip galvanizing gives strong corrosion protection without disturbing other properties of the steel.

It is important that all parts of the bridge are galvanized to avoid weak points. Material test have been carried out to make sure that galvanizing not affect the mechanical properties of the steel. For the coating thickness it has been decided that a target value of 200 microns is suitable. The silicon content of the steel is in the area 0.14 ≤ Si ≤0.35 % and the phosphorus content P ≤ 0.035 %. The aluminium content should be limited to Al ≤0.035 %.

Fire resistance of galvanized structures (M. Mensinger, University of Munich)

High costs for passive fire protection can be avoided by determination of the critical failure temperature of the steel structure according to the Eurocode EN 1993-1-2. For this purpose, positive effects of hot dip galvanized coatings on the temperature development of steel members exposed to fire has been investigated. The test result shows a significant better heating behaviour for hot dip galvanized steel components compared to steel specimen without galvanization. The study has shown that an R30 fire resistance requirement can be reached without additional passive fire protection.

Slip resistant connections with galvanized steel (N. Stranghöner, University of Duisburg Essen)

In the large EU project SIROCO slip resistant connections for many different materials have been studied, among others for galvanized steel. Since earlier reported friction coefficients in hot dip galvanized plates show large variations, e.g. from 0.15 to 0.50, it is of interest to find out more. In practice the wide span results in use of the lower values for design of constructions. It is understood that the difference in slip factor depends on the difference in coating structure influenced by steel composition and galvanizing process variables. Slip resistant connections are required when deformations in bolted connections must be limited. Typical applications can be found in bridges, cranes, radio masts and towers for wind turbines which are loaded by alternate loading and/ or fatigue, or where functional requirements make slip-resistant connections necessary.

The result showed that higher static slip factors in the range of 0.35-0.40 for hot dip galvanized surfaces can be achieved when the outer zinc layer is sufficiently removed by a light blasting procedure (sweep blasting) so that the Fe-Zn layers control the slip behaviour. Sweep blasting in combination with application of an alkali-zinc silicate (ASI) paint produces the highest static slip factors observed in these tests, up to 0.62. Thus, more work regarding creep tests are necessary to determine the final slip factors.

Pre-treatment before galvanizing (F Schmelz, RAM Egineering + Anlagenbau)

Careful pre treatment of the steel before galvanizing is of large importance for the result and the cost during of the process. The degreasing process is mainly divided into two different types, alkaline and acidic degreasing. The alkaline degrease is operated at higher temperatures than the acidic degreasing, but the effectiveness of degreasing and the life time of the chemicals are higher and the costs for the chemicals are lower than for acidic degreasing. An insufficient degrease of the steel leads to significant increase both in pickling time and acid consumption.

Pickling of a surface with > 500 mgC/m^2 in comparison to a surface with < 50mgC/m^2:

- The pickling time is up to + 100 times longer
- The acid consumption is up to + 20 times higher

With a pickling acid of 10 % HCl and 50 g/l Fe, the pickling time increases from 15 minutes to 27 hours and the acid consumption increases from 5 g/m² to > 100 g/m²!

These numbers show that the degreasing of steel products in the first pre-treatment step influences the economic data of the galvanizing process in total.

The effectiveness of the degreasing can be increased by higher temperature, increased mass transfer by motion, pumping, ultrasound, air agitation, movement of the work, longer dipping times, and higher concentration of effective ingredients. If alkaline degrease baths are used it is necessary to rinse the material before pickling. The majority of the fluxes are based on zinc ammonia chloride with a melting point around 150 ºC. The flux has

several effects; dissolution of Fe-salts, fine pickling, protection against oxidation, new fine pickling of the steel when dipping it into the zinc melt, dissolving of zinc oxide at the surface while immersion into the zinc melt. The correct and economical function of flux depends on the process parameters density, pH value, temperature and iron content.

The density is given by the salt content in the flux, normally 400 – 425 g/l is recommended. A low salt content leads to insufficient drying of the salt layer and with this a transfer of moisture into the zinc, and also a not fully salt layer on the steel surface, i.e. lower corrosion protection.

The pH of the flux should be kept between 3,5 and 5,5. Below 3,5 means pickling in the flux and because of that increasing iron content. pH above 5,5 could give increased amount of ash. The temperature of the flux has no influence of the layer formation but on the drying time. A temperature of 50 ºC is recommended. The iron content should be kept to lower than 5 g/l. Both this study and references has shown a direct dependency between pH value and iron content with the overall zinc consumption in the HDG process.

Pre treatment and the avoidance of deviations like black spots was a frequently mentioned topic at the conference and at the exhibition.

Influencing the galvanizing with the bath composition (R Pankert, Boliden)

Use of alloyed zinc melts is quite common in general galvanizing. Focus has mostly been on coating thickness reduction on reactive steel. New steel compositions are penetrating the market, and there are a number of deviations that can occur during galvanizing. Most of the defects can be related to mainly four origins:

- Excessive Zn-Fe reaction
- Surface contamination of the steel
- Bad wettability of the steel by the liquid zinc
- Iron precipitations through composition or temperature changes

When steel is dipped into the zinc melt it starts to dissolve and this iron will start to compose the first zeta-phase, which later converts to the compact delta phase. With increasing Si-content in the steel the amount of dissolved Fe is increasing.

It is known that it is difficult to galvanize on laser cut edges. Poor adherence of coatings is attributed to the formation of stable oxides which often can’t be removed in the pickling step. To summarize: Fe dissolution increases with Si and P contents in the steel but also with amount of martensite (influenced by cooling of the steel in earlier treatment) and of dislocations (due to cold working of the steel).

Wettability also plays an important role, as any disturbances of the wetting of steel will generate different types of abnormalities. To avoid or reduce many types of surface defects, a zinc melt having a good wettability and favouring creation of the delta-phase, will therefore be desirable.

Alloying elements can be classified in elements taking part in the Zn-Fe reaction (For example aluminium and nickel) and elements not taking part in the reaction, such as lead, bismuth and tin, which only affects the physical properties of the melt.

Aluminium has an inhibition effect on coating growth of reactive steels. Nickel has a compactation effect on the Fe-Zn-layer, and thus slow down the reaction.

Lead has been a very effective element to improving drainage of the zinc as well as wettability and sinking of dross particles. Potential substitutes for lead are tin and bismuth, but studies have shown that the influence from these elements on the melt viscosity is very low. For the surface tension, the effect of bismuth is good. For wettability, which is a very important parameter, both bismuth and tin have a positive effect.

A bright future for galvanized steel in the circular economy (B Dursin, Zinkinfo Benelux)

What does circular economy actually mean? It is a move from linear business models, in which products are manufactured from raw material and then discarded at the end of their useful lives, to circular business models where intelligent design leads to products and their parts being repaired, reused, returned and recycled. The concept of the circular economy drives optimal resource efficiency. In addition, products need to be designed to be durable, easy to repair, and, ultimately, to be recycled. European commission is pushing towards circular economy for many reasons; the world population growth, we wear a huge responsibility for future generations, today Europe is strongly dependent on the import of natural resources (90 % is coming from non EU-members) That is a major strategic risk that have to be reduced.

The construction sector represents 40 % of material use, 50 % of CO^2 emissions, 20 % of water use, 25 % of all transports, so this is a really important area for circular economy! Steel has a strong case and hot dip galvanizing can strengthen the arguments pro-steel in the debate. Galvanizing ensures low maintenance cost, interesting for investors, galvanized steel means very limited or no repairs required before reuse, and the TLCC are excellent compared to painted steel.

Galvanized Utility Tunnels in China (Q Zhang, Beijing)

Underground utility tunnels for electric power, water, communications, gas, heating lines and other public services, are an important part of smart cities. At present the main part of these tunnels in China are made of concrete. During the construction process the surrounding and the traffic is affected. A long construction period is needed, and the later maintenance is very difficult. Galvanized corrugated steel structures are an interesting alternative with many benefits. Compared to traditional prefabricated concrete tunnels or cast in place- tunnels the galvanized steel tunnels have many advantages such as lower costs, short construction period, high safety, long service life and environmental friendly. The galvanized steel tunnels will take over in China and create a demand for steel, which is good since China have an over capacity in steel production.

Beyond construction – galvanizing in other applications (H Glinde, Industrieverb. Feuerverzinken)

Approximately 50 % of all batch galvanized steel in Germany is used in the construction industry. Beside that the transport and automotive sector and mechanical engineering are other important markets.

Until the 1970ies corrosion had been a big problem for the automotive industry. Rusty cars were all around. Lack of corrosion protection and bad steel quality ensured that even most cars from the premium segment had to be repaired by welding after 10 years. In 1975 Porsche 911 was the first car to receive a continuously galvanized body. Ten years later Audi started the mass production of what they called “complete galvanized” using a mix of continuously galvanized and electroplated parts. Audi did a huge global advertising campaign brought the message that galvanizing is the best protection against rust into everybodys mind. Galvanizing became for the automotive industry the super hero for corrosion protection. Many other car producers started to offering galvanized cars.

A few car producers like Talbolt Matra, Renault, Lotus and BMW introduced batch galvanized chassis for some models.

Today in Germany the main markets for batch galvanizing in the automotive industry are production of components for cars, chassis and other components for light commercial vehicles, car trailers and truck trailers. To saving weight and costs many car producers reducing the steel thickness of bodywork. As a result, the underbodies of the cars must be reinforced by stabilizers to achieve the necessary stiffness. Galvanizing is the best solution for underbody parts and are used by the premium car producers like BMW and Mercedes Benz.

Small series: Batch galvanized chassis for restoration of classic cars

Galvanized reinforcement (P Golding, Galvanizers Association Australia)

A passive oxide film forms on the surface of steel or zinc in concrete. If that film brakes down, the corrosion rate can be high. The benefit with using galvanized reinforcement is that the chloride level, Cc, can be higher without corrosion to occur. There are many positive results from costal exposures of galvanized steel. One example is Longbird bridge, with no deterioration of the galvanizing even though the chloride level was 1,2 wt% cement, i.e. three times C often quoted for conventional reinforcement. Galvanized reinforcement has been widely used in many docks, jetties, pontoons and buoys, for example the Onimichi Pier in Japan, the Lillholmens Pontoon Bridge in Finland and the Lamma Island Pier in Hong Kong.

A perfect example of the benefit of galvanized reinforcement is in precast parapets on bridges where it is used to allow low covers and more attractive and lightweight units.

Integration of the kettle cover in the zinc bath enclosure (F. Nerat, KVK Koerner)

Energy saving is an important point in hot dip galvanizing plants. When the furnace is in idle mode more than 95 % of the energy loss is via the zinc surface of the kettle. Therefore kettles are covered if there is no production, in order to reduce energy consumption. With a new technique very quick manipulation of the cover is possible, which means that it is possible to cover the surface also at very short non galvanizing periods. This special design makes sure that the cover has 2 different functions. It is working as a normal lateral window of the zinc bath enclosure which is opened for cleaning the zinc furnace after material is immersed into the zinc. Before the next dip the window is closed again, like a normal enclosure. If there is a production brake, (pause, no material available, delays in pre treatment etc) the window can be lowered further to by means of the normal lifting device and is hinged onto the surface. So it is possible to cover the furnace quickly and a lot of energy can be saved.

Works visit

As always at the Intergalva conferences many different types of works visit was possible.Since Germany is a country where the galvanizing technique is in the front there were many interesting possibiities, both with galvanizing and powder coating plants.

As said in the introduction, this was a really good conference! It was possible to learn a lot, meet many people and have fun too. EGGA has now set a really high level for the future and it will be a challenge for them to meet expectations in next Intergalva, which will be arranged in Italy 2021.