

Third School Year

CORROSION PROTECTION

Corrosion causes great damage *due to* material loss. That is why it is necessary to **protect** material against **corrosion**.

It is possible to categorize methods of **corrosion protection** into several groups:

1. Protection by suitable selected material

There are alloyed steels, for example with chromium, which are more resistant against **corrosion**. According to the kind of stress and type of **corrosion** environment it is necessary to carefully select steel, which doesn't have a tendency to corrode in specific conditions.

2. Protection by suitable structures or production technology

It is necessary to limit the formation of galvanic micro- and macro-cells, which **speed up** the course of **corrosion**. In regards to structure **durability** it is possible to add surplus material against **corrosion**, which **ensures** the stability of the structure during its entire life.

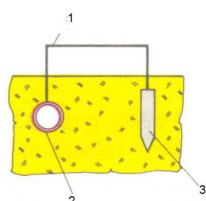
3. Protection by changing the corrosive environment

This deals with reducing the concentration of matter, which **speeds up** the course of **corrosion**, for example reducing **moisture** in an environment, the treatment of industrial water, adding **corrosion inhibitors** to heating systems, and other operations.

4. Electrical-chemical protection against corrosion

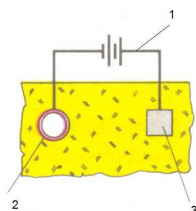
It is used as **protection** against **corrosion**, which is formed by **stray currents** close to electrified lines. **Stray currents** cause the **corrosion** of metal **piping** and **wiring** placed in the ground.

By **sacrificial anode**– the anode is of lesser noble material



1. Conductor
2. Protective piping
3. Sacrificial anode

By the **source of external current** – the anode is from the same material as the protective **piping** and the **source** of the **current** directs the flow of electrons so that the anode **melts**.



1. Current source
2. Protective piping
3. Auxiliary anode

5. Protection against corrosion using coatings

It is possible to categorize coated materials according to their function into several groups:

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

a) *Coats fully isolated from the corrosion environment*

- **Plastics**

- *Thermoplastics*
- *Elastomers*
- *Reactive plastics*



Isolation of *pliers*



Plastic-coated *wire fence*



Teflon-layer covered *piston*

- **Enamels**

Enamel is borosilicate glass, which has a compact layer created as its *coat*. For example, it is used in the food processing industry for health sanitarness.



Enamelled kitchen sink

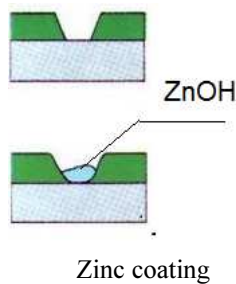
- **Tar and asphalt**

These substances are used for hydro-isolation *coats*, which *protect* against atmospheric *corrosion*.

- **Metal coatings**

With an electrical-chemical potential higher than the electrical-chemical potential of the protected material - for example the *coating* of *tin*.

b) *Protective coats on the basis of an electrical-chemical function*





evropský
sociální
fond v ČR



EVROPSKÁ UNIE



MINISTERSTVO ŠKOLSTVÍ,
MLÁDEŽE A TĚLOVÝCHOVY



OP Vzdělávání
pro konkurenceschopnost



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Zinc is ***melted*** and ZnOH is created. It ***fills in*** a ***crack*** so that it does not lead the surrounding environment to a protected metal with a higher electrical-chemical potential.

c) Coats containing *corrosive inhibitors* – paints

It is possible to categorize paints according to many points of view:

- according to the number of layers: single-coated or multi-coated (the ***base coat*** contains ***corrosion inhibitors*** and the upper layer is ***permeable***)
- according to drying temperature: ***coats*** can dry in normal or higher temperatures, or are ***baked***
- according to the ***drying*** mechanism: physical, chemical or physical-chemical ***drying***

Coating with paint:

Before painting, it is necessary to carefully delubricate a surface, to ***remove*** a ***corrosive*** layer by ***jet-spraying***, or ***pickling*** and other operations.

Methods of coating with paints:

- By painting using a paint brush or roller
- By spraying
- By ***soaking***
- By rolling up on a sheet
- By spraying powdered paint in an electric static field and the consequent ***baking*** of the ***coated*** layers

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

VOCABULARY

bake	vypalovat	noble	ušlechtilý
base coat	základový nátěr	permeable	propustný
cell	článek	pickling	moření
coat, coating	nátěr, natírání	piping	potrubí
conductor	vodič	pliers	kleště
corrosion	koroze	protect	chránit
corrosive	korozní	protection	ochrana
crack	trhlina	remove	odstranit
current	proud	sacrificial	obětovaný
drying	zasychání	soaking	namáčení
due to	kvůli, vlivem	source	zdroj
durability	životnost, trvanlivost	speed up	zrychlovat
enamel	smalt	stray	bludný
ensure	zajistit	suitable	vhodný
fill in	vyplnit	tar	dehet
inhibitor	inhibitor, zpomalovač	tin	cín
jet-spraying	otryskání	wire fence	drátěný plot
melt	tavit, tavenina	wiring	vedení, rozvod
moisture	vlhkost		

COMPREHENSION QUESTIONS

1. What do you know about corrosion?
2. How do we categorize methods of corrosion protection?
3. What is enamel?
4. What methods of coating with paint do you remember from the text above?

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

EXERCISES

1. Name what you see in the pictures:

1



2



3



4



5



6



7



8



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

2. Match A with B. Then translate the expressions into Czech:

A	B	
1 industrial	a current	_____
2 corrosive	b system	_____
3 electrical	c protection	_____
4 protective	d material	_____
5 alloyed	e cell	_____
6 heating	f water	_____
7 macro-	g anode	_____
8 corrosion	h steel	_____
9 sacrificial	i inhibitor	_____
10 noble	j piping	_____

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

EXERCISES – KEY FOR TEACHERS

1. Name what you see in the pictures:

- | | |
|----------------|--------------|
| 1 crack | |
| 2 paint brush | 6 wire fence |
| 3 piston | 7 pliers |
| 4 corrosion | 8 piping |
| 5 kitchen sink | |

2. Match A with B. Then translate the expressions into Czech:

A	B	
1 industrial	f water	<i>průmyslová voda</i>
2 corrosive	i inhibitor	<i>inhibitor koroze</i>
3 electrical	a current	<i>elektrický proud</i>
4 protective	j piping	<i>chráněné potrubí</i>
5 alloyed	h steel	<i>legovaná ocel</i>
6 heating	b system	<i>topení, vytápěcí soustava</i>
7 macro-	e cell	<i>makročlánek</i>
8 corrosion	c protection	<i>ochrana proti korozi</i>
9 sacrificial	g anode	<i>obětovaná anoda</i>
10 noble	d material	<i>ušlechtilý materiál</i>