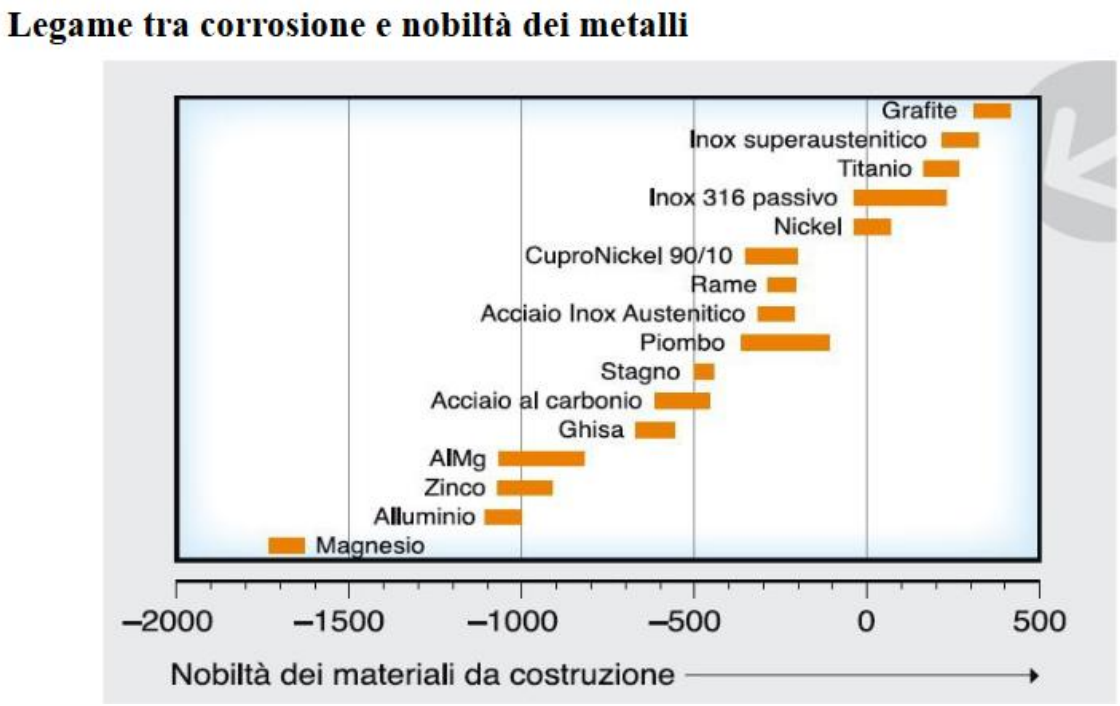
GALVANIC CORROSION

The phenomena of galvanic corrosion is a wet corrosion process that originates between any pair of different metals far enough in the electrochemical series and placed in direct contact.
Contacting a less noble metal and a nobler metal will form a "galvanic coupling" where the less noble metal will be subject to corrosion, acting as anode, while the more noble metal, the cathode, will remain intact.

Metal elements in corrosive processes are affected by:
• The difference in potential between the elements;
• Environmental conditions;
• Alkalinity;
• The relationship between cathode and anodic areas;
• The active or passive nature of the metal.

The difference in potential between two elements is related to the nobility of the two metals, the more distant the elements are in the galvanic scale, the bigger it is this difference.

Two materials are "galvanically compatible" if making pairs of materials in galvanic series is close by.
See for example in fig. 3c, Stainless steel and nickel are "galvanically compatible", while the
Nickel and chromium, which have a potential difference of 770mV, are "galvanically
Incompatible. "It will be a passage of negative charges from chromium, anode, nickel, cathode,
Resulting in chromium corrosion.



Chart_LINK BETWEEN CORROSION AND NOBILITY OF THE METALS

When we connect two different potential elements, we generate an electron stream from the
Less noble material (having less potential), called anode or negative pole that oxidizes,
Towards the nobler one with greater potential, called a positive cathode or pole that is reduced.
Such reactions are called oxidation redox or redox reactions from the English "reduction" and "oxidation".
By convention, the direction of the electric current is taken opposite to the flow of electrons, so it does it has a direct current flow from the anode to the cathode; the same stream circulates in the opposite direction in the electrolyte, transported by the ions dissolved in it.

Environmental conditions

The environment mainly produces chemical or galvanic corrosion, which are respectively related to pH and humidity.

In high resistivity environments corrosion is limited to the anode area near the junction with the cathode area. For this reason this type of corrosion is particularly severe in sea water but not in freshwater which has a conductivity of at least two orders of magnitude lower

Situation in Rolling Mill Stands

In the specific case, where the stainless steel plate is in contact with the housing of the mill stand usually made of Fe, the problem of galvanized corrosion could arise if austenitic stainless steel was used, such as AISI316, which due to high nickel content and other noble alloy elements could create galvanic corrosion problems on the contact material, normally as mentioned Fe or low carbon steel.

In case of Romani Anticorrosion liners, this problem doesn't occur since the basic material is a martensite stainless tool steel (or mould steel) with high content of Cr and low alloy elements. See below characteristics:

1.2083 / 420SS Plastic Mould Steel-Martensite

Standards	DIN	AISI	JIS	ГОСТ
X42Cr13 / X40Cr14	1.2083	420SS	SUS420J2	40X13

Chemical composition (typical analysis in %)

C	Si	Mn	P	S	Cr
0.36-0.45	≤1.00	≤1.00	≤0.030	≤0.030	12.5-14.5

Hence the association between the material of the mill stand and the liner, considered as "contact potential difference" should be considered as between Steel (acciaio) and Chrome (cromo), which as possible to see in the below chart is around 200 milli/volts, which is very limited and not below the red line, which is considered the limit below which the material is considered "attacked"

Metalli associati → / Metalli considerati ↓	Inox	Nickel	Rame	Ottone	Stagno	Acciaio	Alluminio	Cromo	Zinco
Inox	0								
Nickel	180								
Rame	320	140	0						
Ottone	400	220	80	0					
Stagno	550	370	230	150	0				
Acciaio	750	570	430	350	200	0			
Alluminio	840	660	520	440	290	90	0		
Cromo	950	770	630	550	400	200	110	0	
Zinco	1150	970	830	750	600	400	310	200	0

Le differenze di potenziale sono espresse in millivolts.
Sotto la linea rossa, il metallo considerato viene attaccato.

fig.3c : Differenze di potenziali relative tra i materiali.

Further, the relationship between areas is worse when the anodic area is small compared to that Cathode, as the corrosive attack focuses on the limited area. A typical example may be the use of iron joints (nails or screws) on copper structures, where the nuts will be subject to severe corrosion and rapid propagation.