Industeel

Mold steels for corrosive applications

ArcelorMittal

Industeel mold steel offer for corrosive applications

For tools used in harsh environments such as marine, salty or wet air, or in contact with acidic gaz, particularly corrosion-resistant steels are now available on the market.

It is important, however, that the entire mold is designed to be corrosion resistant otherwise various components will develop rust particles during production and contaminate the entire mold.

Corrosion is the reaction of a metallic material to its environment, resulting in lasting damage and impairment of the material's function. On materials, corrosion can be captured quantitatively and/or qualitatively. Corrosion can take the form of cracks, holes, cavities or wall thickness decreases.

Industeel offers the following range of corrosion resistant steels suitable for molding applications:

Grade	Chemical composition in %									Delivery conditions*
	C	Mn	Si	S	Cr	Mo	Ni	Cu	Nb+Ta	
Superplast Stainless (SPS) 1.2099	0.07	1.40	0.15	0.12	12.0	-	0.5	-	-	Prehardened 280 – 330 HB
1.2085	0.33	1.1	0.30	0.07	16.0	-	-	-	-	Prehardened 280 – 325 HB
1.2083	0.40	0.60	0.40	0.001	13.0	-	-	-	-	Annealed < 230 HB Prehardened 280 – 325 HB
1.2316	0.40	0.90	0.35	0.002	16.0	0.90	-	-	-	Prehardened 280 – 325 HB
17-4 PH 15-5 PH	0.035	-	< 0.8	0.001	16.0	-	4.80	3.40	0.30	Age hardened 290 – 380 HB

*All the grades are delivered stress relieved. A stock offer is available for grade 1.2085.

Grade	Corrosion resistance	Machinability	Polishability	Thermal conductivity	Food compatibility	Typical delivery size* Thickness (mm)	Typical applications
1.2099 (SPS)	++	+++	++	+++	Yes	15-350	Mold holders, support plates, hot runners and mold components
1.2085	++	++	+	++		15-350	Mold holders and support plates
1.2083	+++	+	+++	++		15-130	Cores, inserts and mold cavities
1.2316	+++	+	++	+		15-225	Cores, inserts and mold cavities for working with aggressive plastic
17-4 PH 15-5 PH	+++	+	++	+		200-600	Inserts cavities and extrusion dies

*All the grades are available in width of 1000-2500 mm and in length up to 12 m.

Applications

SPS : **Corrosion resistant mold steel** with excellent machinability, high dimensional stability, consistent hardness and improved thermal conductivity.
To be used for **mold holders, support plates, hot runners and mold components.**
It could be used for all the applications with **low to moderate corrosion products** (typically wet environment, etc).

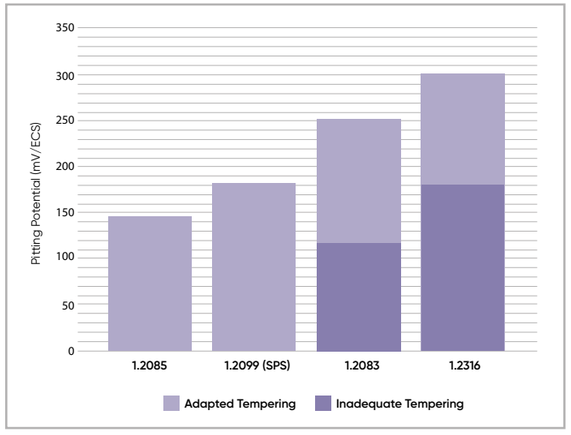
1.2085: **16%Cr resulphurized mold steel** combining improved corrosion resistance properties and good machinability.
This steel is commonly used for mold steel applications including **holders or support plates subjected to wet working and/or storage conditions.**
The grade is not designed for highly polished or etched surfaces.

1.2083 : **Mold steel with improved corrosion resistance properties** combining a **good atmospheric corrosion resistance,** an excellent polishability, a good machinability in annealed condition, a high hardenability and a good wear resistance.
To be used for mold plates and inserts.

1.2316 : **Cr-Mo mold steel for enhanced corrosion resistant properties** and fine polishing thanks to the high cleanliness/homogeneity (mirror finish).
This steel is commonly used for mold steel applications including **cores, inserts and mold cavities working or stored in humid environments.**
This grade is also used for the **production of corrosive materials like PVC.**

17-4 PH/15-5 PH : **Precipitation hardening stainless steel grades** combining high strength and hardness, with good toughness and corrosion resistance.
Mechanical properties can be optimized with heat treatment.
To be used for **inserts cavities and extrusion dies.** These grades withstand corrosive attack better than any of the standard hardenable stainless steels and are **comparable to type 304 in most of corrosive media.**

Pitting corrosion



Selecting the mold steel composition is not enough to ensure the righ properties of the steel, the optimal production route is also very important. The corrosion behaviour of stainless plastic mold steels is correlated with the evolution of the microstructure during tempering.
Tempering at not appropriate temperature lead to the precipitation of chromium carbides and the decrease of the chromium content in the area close to the precipitates. As a consequence the corrosion resistance of the stainless steel plastic mold is affected as seen on the diagram here above.

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