

1.

STEELMAKING

CONTINUOUS CASTING



PROCESS MONITORING
CC mould with optical fiber

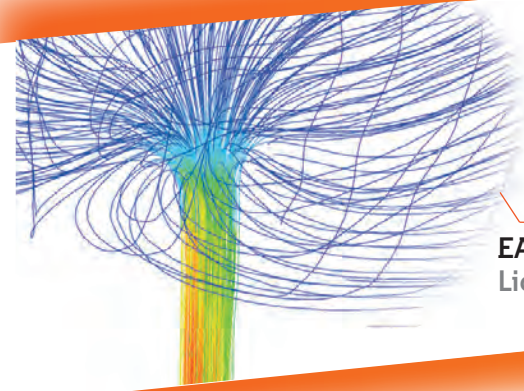
NANOTECHNOLOGY
Control of second phase particles

PROCESS CONTROL
Refractory temperature measurement

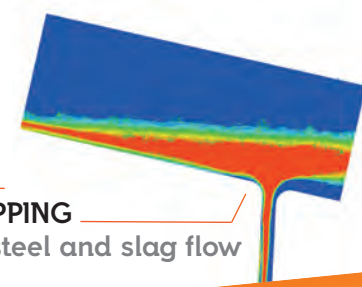


INGOT CASTING

ELECTRIC ARC FURNACE



EAF TAPPING
Liquid steel and slag flow



CASTING MOULD DESIGN
Ingot casting solidification

BILLET STRAIGHTENING
Residual stress

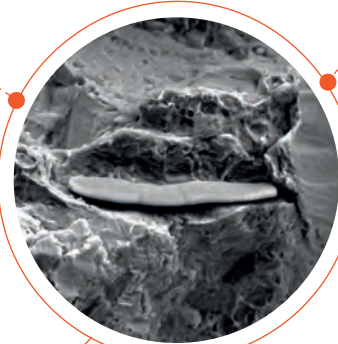


INGOT



INDUCTION VACUUM MELTING & CASTING FURNACE
Manufacturing of new steels

FIELD EMISSION ELECTRON MICROSCOPE
Analysis of inclusions, fractures and structures



2.

METALWORKING

DATA ANALYSIS AND TREATMENT
Thermographic temperature control



ROLLING

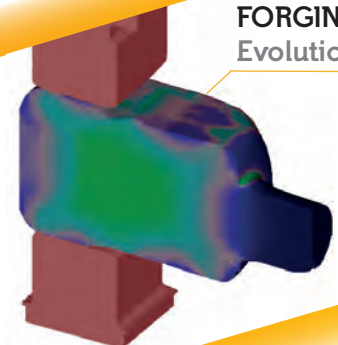


VALIDATION OF MATHEMATICAL MODELLING
Characterization of thermal profiles

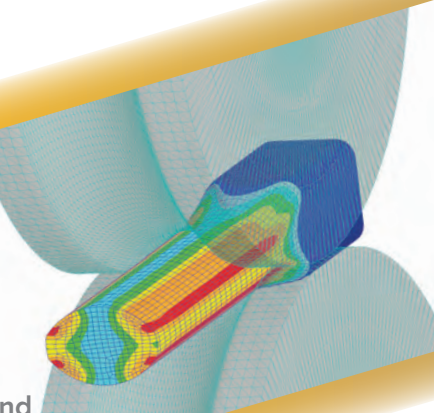
OPEN DIED FORGING
OF PARTS UP TO 150 TONS



FORGING PROCESS
Evolution of effective strain



PASS DESIGN
Stress, strain and damage criteria



PRESS 500 TONS
Cold and hot upsetting



HEAT TREATMENT FURNACES



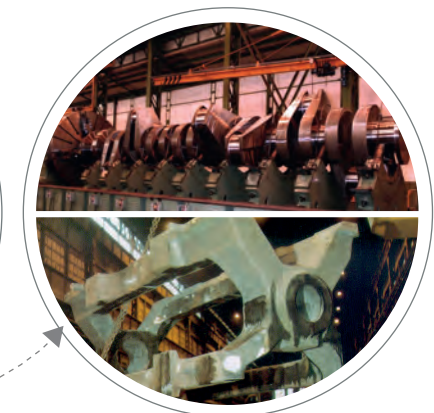
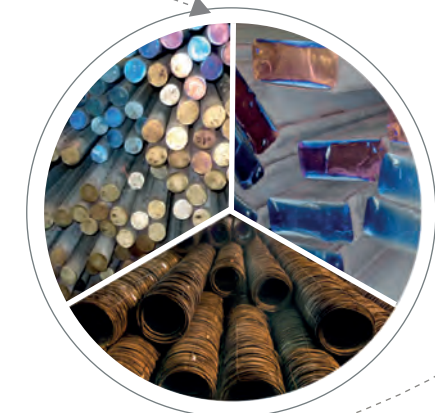
DILATOMETER
Determination of CCT diagrams and critical points



THERMAL-MECHANICAL SIMULATOR

3.

PRODUCT

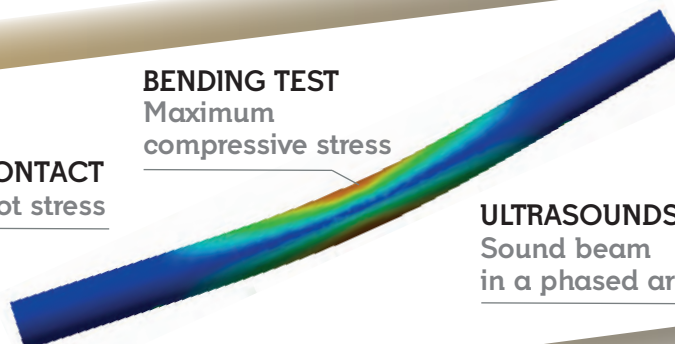


Engineering Steel Long Products
Stainless Steel Long Products
Steel Casting and Forgings

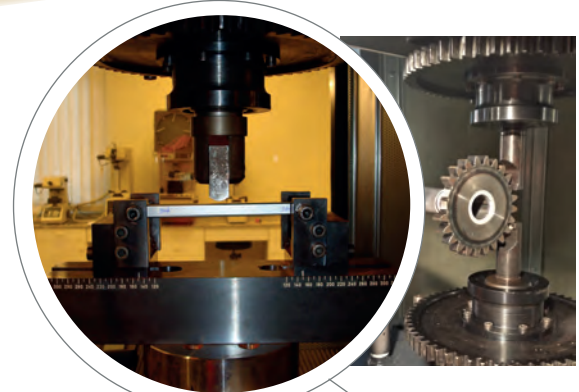
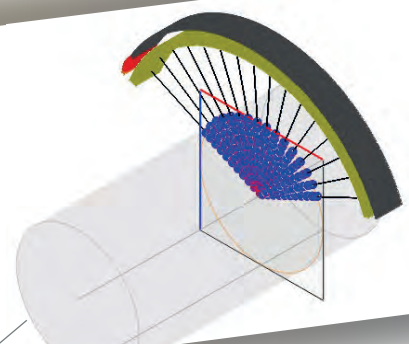
GEAR CONTACT
Tooth root stress



BENDING TEST
Maximum compressive stress



ULTRASOUNDS
Sound beam in a phased array



MECHANICAL CHARACTERIZATION EQUIPMENTS
Tensile and fatigue limit at room and high temperature

ULTRASONIC EQUIPMENT
Cleanliness control



MICROHARDNESS TESTER
Hardness profiles at different loads



CN LATHE
Machinability testing



OPTO-DIGITAL MICROSCOPES
Tool wear and microstructure characterization





ACENOR I+D
Foundation of the R&D center

1995

SIDENOR I+D

2005

GERDAU
SIDENOR I+D

2012

GERDAU I+D

2016

SIDENOR I+D



30
YEARS OF
R&D

With the vision of
being the metallur-
gical reference for
Sidenor and its
customers.

Our mission is to
create, develop,
transfer and protect
Sidenor Technology
in order to reach
innovative solutions
in the production
and use of steel
materials and steel
components.

HARDNESS CONVERSION VALUES				
Ø huella bola 10 mm 29420 N	HB	R (N/mm ²)	HRB	HV
5,75	105	380	62,0	110
5,65	109	390	64,6	115
5,54	114	410	67,0	120
5,44	119	420	69,0	125
5,34	124	440	71,0	130
5,25	128	450	73,1	135
5,17	133	470	75,1	140
5,08	138	480	77,0	145
5,00	143	500	78,8	150
4,93	147	510	80,5	155
4,86	152	530	82,1	160
4,78	157	540	83,5	165
4,71	162	550	85,0	170
4,66	166	570	86,1	175
4,59	171	580	87,3	180
4,53	176	600	88,5	185
4,47	181	610	89,6	190
4,43	185	630	90,7	195
4,37	190	650	91,8	200
4,32	195	660	92,8	205
4,26	200	680	93,7	210
4,22	204	690	94,6	215
4,18	209	710	95,5	220
4,13	214	720	96,3	225
4,08	219	740		230
4,05	223	750		235
4,01	228	770	20,3	240
3,97	233	780	21,3	245
3,93	238	800	22,2	250
3,89	242	820	23,1	255
3,86	247	830	24,0	260
3,82	252	850	24,8	265
3,78	257	860	25,6	270
3,76	261	880	26,4	275
3,72	266	890	27,1	280
3,69	271	910	27,8	285
3,66	276	930	28,5	290
3,63	280	940	29,2	295
3,60	285	960	29,8	300
3,54	295	990	31,0	310
3,49	304	1020	32,2	320
3,44	314	1060	33,3	330
3,39	323	1090	34,4	340
3,34	333	1120	35,5	350
3,30	342	1160	36,6	360
3,25	352	1190	37,7	370
3,21	361	1220	38,8	380
3,17	371	1260	39,8	390
3,13	380	1290	40,8	400
3,09	390	1330	41,8	410
3,06	399	1360	42,7	420
3,02	409	1400	43,6	430
2,99	418	1430	44,5	440
2,97	423	1470	45,3	450
2,94	432	1500	46,1	460
2,91	442	1540	46,9	470
2,88	450	1570	47,7	480
2,86	456	1610	48,4	490
2,84	466	1650	49,1	500
2,81	475	1680	49,8	510
2,79	483	1720	50,5	520
2,76	492	1760	51,1	530
2,74	500	1790	51,7	540
2,72	509	1830	52,3	550
2,69	517	1870	53,0	560
2,67	526	1910	53,6	570
2,65	535	1940	54,1	580
2,63	543	1980	54,7	590
2,61	552	2020	55,2	600
2,59	560	2060	55,7	610
2,57	569	2100	56,3	620
2,55	577	2140	56,8	630
2,53	586	2180	57,3	640
		2220	57,8	650
			58,3	660
			58,8	670
			59,2	680
			59,7	690
			60,1	700
			61,0	720
			61,8	740
			62,5	760
			63,3	780
			64,0	800
			64,7	820
			65,3	840



Sidenor I+D

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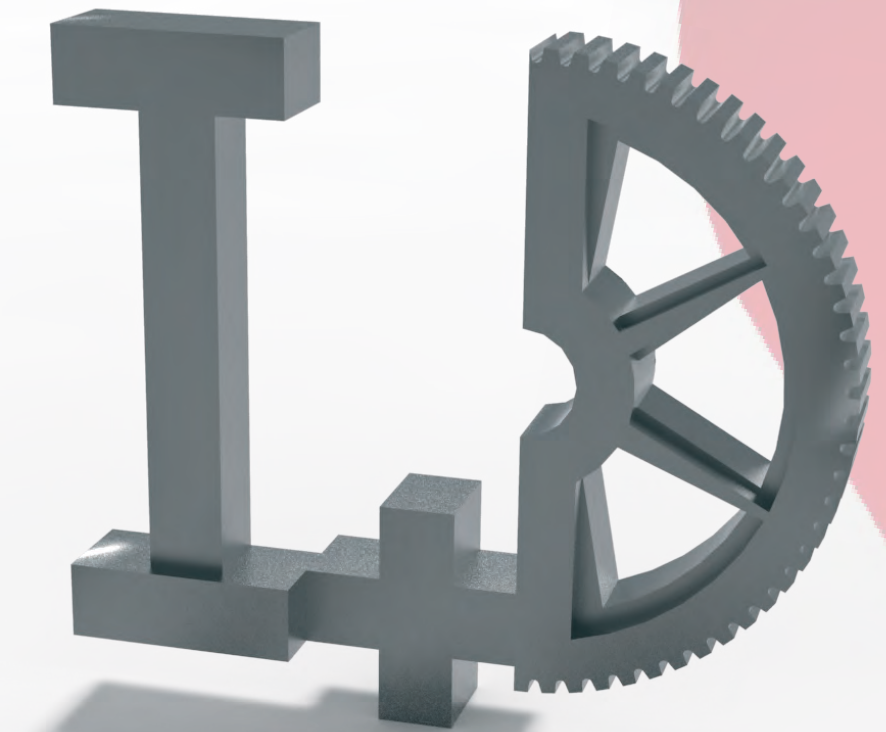
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Longitude: -2.885671



Reinosa

Paseo de Alejandro
Calonge s/n
39200 Reinosa (Cantabria)
Tel. +34 942 775050

GPS Location:
Latitude: 42.988955
Longitude: -4.142732



Research and Development
in Special Steels
Process & Product