



REFERENCE LIST - BLAST FURNACE REPAIR

#	Year	Country	Company	Works	BF #	Working Volume [m ³]	Hearth Diameter [m]	Daily Production [tHM / day]	Scope	BF Section	Product used	Qty [ton]	Total Qty [ton]	Product Type	Technology	Installation Technique
1	2011	Russia	Novolipetsk Iron & Steel	Lipetsk	7	4.200	13,2	12.000	Capital relining	Hearth and tuyere belt Stack	Seven Grout 48 N Seven Grout 55 NM	41 123	164	Grouting	Pumping	Robotic installation
2	2011	Russia	Novolipetsk Iron & Steel	Lipetsk	5	3.200	12,0	8.000	Partial reprofiling	Tuyeres belt Lower stack Upper stack Tuyeres ring Back staves filling	Seven Shot 75 NB 01X Seven Shot 60 NH CO Seven Shot 75 NB 01X Seven Shot 60 NH CO Seven Ram 4355 KR Seven Grout 48 NM Seven Cast 55 N SIC	180 100 234 181 35 60 25	790	Castable Plastic Grouting Castable	Shotcreting Ramming Pumping Vibrating cast	By lifting platform Robotic installation Precasted pieces
3	2012	Russia	EVRAZ - NTMK	Nizhny Tagil	5	2.200	11,8	7.000	Copper staves change	Bosh & belly	Seven Ram 4355 KR Seven Grout 55 NM	5 5	35	Plastic Grouting	Ramming Pumping	Robotic installation
4	2012	Russia	Tulachermet	Tula	1	1.386	8,6	2.800	Capital relining	Bosh Belly & lower stack Upper stack Lower and medium stack	Seven Cast 75 NB 01X-SF Seven Flow 65 NH CO Seven Cast 55 N SIC-SF Seven Cast 75 NB 01X Seven Shot 60 NH CO Seven Ram 4355 KR Seven Grout 48 NM	28 25 100 100 142 38 63	496	Castable Plastic Grouting	Vibrating cast Vibrating cast Self-flowing cast Shotcreting Ramming Pumping	Precasted pieces By lifting platform
5	2013	Russia	Tulachermet	Tula	2	1.234	8,3	2.500	Capital relining	Bosh Belly & lower stack Upper stack Back staves filling Staves joints upper stack Staves joints lower stack Tuyeres belt	Seven Shot 75 NB 01X Seven Shot 65 N SIC Seven Shot 60 NH CO Seven Grout 48 NM Seven Plast 70 CH CO Seven Plast 4355 KR Seven Shot 75 NB 01X Seven Shot 75 NB 01X	76 142 126 34 8 15 84 140	485	Castable Grouting Plastic Castable	Shotcreting Pumping Ramming Shotcreting	By lifting platform Robotic installation By lifting platform
6	2013	Ukraine	Alchevsk Metallurgical Kombinat	Alchevsk	1	2.100	11,3	5.200	Partial repair	Lower stack	Seven Shot 60 NH CO	140	280	Castable	Shotcreting	Robotic installation
7	2013	Ukraine	Alchevsk Metallurgical Kombinat	Alchevsk	4	1.386	8,2	3.100	Partial repair	Bosh Lower stack Middle stack Dome	Seven Shot 30 N SIC Seven Shot 75 NB 01X Seven Shot 60 NH CO Seven Shot 60 NH CO	40 140 210 20	410	Castable	Shotcreting	By lifting platform
8	2014	Russia	Novolipetsk Iron & Steel	Lipetsk	5	3.200	12,0	9.000	Injection inside the furnace	Lower stack	Seven Grout 84 CB	20	20	Grouting	Pumping	From outside the furnace
9		Russia	Novolipetsk Iron & Steel	Lipetsk	5	3.200	12,0	9.000	Partial repair	Belly Lower stack	Seven Shot 75 NB 01X Seven Shot 60 NH CO	37 260	297	Castable	Shotcreting	Robotic installation
10		Ukraine	MMK Iliche	Mariupol	5	2.300	12,6	3.800	Partial repair	Belly Lower stack	Seven Shot 65 N SIC Seven Shot 60 NH CO	170 200	370	Castable	Shotcreting	Robotic installation
11		Russia	KMZ - Kosogorskiy Metallurgical Zavod	Tula	1	1.066	7,2	2.300	Injection inside the furnace	Bosh & belly	Seven Grout 84 CB	30	30	Grouting	Pumping	From outside the furnace
12	2015	Russia	KMZ - Kosogorskiy Metallurgical Zavod	Tula	1	1.066	7,2	2.300	Injection inside the furnace	Bosh & belly	Seven Grout 84 CB	30	30	Grouting	Pumping	From outside the furnace
13	2015	India	JSW - Jindal South West	Bellary	1	1.250	8,0	2.200	Monolithic Hearth Repair	Hearth and tuyere belt	Seven Cast 2272 UB Seven Cast 3462 UR Seven Cast 70 NH Seven Shot 65 N SIC Seven Shot 75 NB 01 X Seven Shot 49 NM CO	104 76 21 15 64 15	295	Castable	Pumping Shotcreting	From inside the hearth
14	2015	Ukraine	JSC Zaporizhstal	Zaporozhye	2	1.503	9,0	3.300	Capital relining	Back stove filling (Tuyeres Belt, Bosh, Belly, Lower and Middle Stack)	Seven Grout 48 NM	60	60	Grouting	Pumping	From outside the furnace
15	2015	Ukraine	MMK Iliche	Mariupol	3	2000	9,6	3700	Partial relining	Stack - Belly - Bosh	Seven Shot 65 N SIC Seven Shot 60 NH CO Seven Shot 49 NM CO	230 130 40	400	Castable	Shotcreting	Robotic installation
16	2015	Russia	Tulachermet	Tula	3	2.200	9,0	4.250	Partial repair	Stack - Belly - Bosh	Seven Shot 75 NB 01X Seven Shot 65 N SIC Seven Shot 65 NH CO Seven Shot 60 NH CO	389 225 65 75	576	Castable	Shotcreting	By lifting platform
17	2015	Ukraine	MMK Iliche	Mariupol	2	1.720	7,8	3.000	Partial relining	Stack - Belly - Bosh	Seven Shot 65 N SIC Seven Shot 60 NH CO Seven Shot 49 NM CO	225 65 75	365	Castable	Shotcreting	Robotic installation
18	2016	Brazil	Gerdau	Ouro Branco	2	1.750		4.000	Partial Relining	Medium Shaft	Carshot Shot B11-S-BR	15	15	Castable	Shotcreting	Robotic installation
19	2016	Brazil	Gerdau	Divinópolis	2			600	Partial Relining	Low Shaft, Belly and Bosh	Carshot Shot B11-S-BR	40	40	Castable	Shotcreting	Fixed Platform
20	2016	Russia	MMK	Magnitogorsk	9	2.014	10,0	4.500	Capital relining	Stack - Belly - Bosh with precasted cooling staves	Seven Cast 71 NB 01 Y -10 Seven Shot 75 NB 01 X Seven Shot 60 NH CO Seven Gun 80 K SIC Plast	75 243 440 21	779	Castable Plastic	Vibrating cast Shotcreting Shotcreting Gunning	By lifting platform
21	2016	Russia	EVRAZ - ZSMK	Novokuznetsk	3	3.000	11,6	6.500	Injection inside the furnace	Stack - Bosh	Seven Grout 45 CM-3	26	26	Grouting	Pumping	From outside the furnace
22	2016	Russia	EVRAZ - ZSMK	Novokuznetsk	2	2.000	9,8	5.400	Injection inside the furnace	Stack - Belly	Seven Grout 45 CM-3	33	33	Grouting	Pumping	From outside the furnace
23	2016	Russia	EVRAZ - ZSMK	Novokuznetsk	3	3.000	11,6	6.500	Injection inside the furnace	Stack - Belly	Seven Grout 45 CM-3	28	28	Grouting	Pumping	From outside the furnace
24	2016	Russia	Novolipetsk Iron & Steel	Lipetsk	6	3.200	12,0	9.000	Partial repair	Cyclone and gas cleaning	Seven Gun 63 RH CO	67	67	Castable	Gunning	From inside the pipes and cyclone



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25	2016	Russia	MMK	Magnitogorsk	4	1.371	8,4	3.460	Capital relining	Bosh - Belly Stack with precasted cooling staves Uncooled part of Stack	Seven Shot 75 NB 01 X Seven Cast 60 NH CO Seven Shot 60 NH CO Seven Shot 49 NM CO Seven Gun 80 K SIC Plast Seven Plast 4355 KR Seven Grout 55 NM Seven Grout 60 NH -3	293 144 182 274 24 17 50 29	1.013	Castable	Shotcreting Vibrating cast Shotcreting Shotcreting	By lifting platform
26	2016	Ukraine	PJSC Azovstal Iron & Steel Works	Mariupol	6	1.717	9,4	2.700	Partial relining	Stack - Belly	Seven Shot 30 N SIC H -3 Seven Shot 62 NH CO	135 260	395	Castable	Shotcreting	Robotic installation
27	2016	Ukraine	MMK Iliche	Mariupol	5	2.300	12,6	3.800	Partial relining	Stack - Belly	Seven Shot 65 N SIC -3 Seven Shot 50 NH CO Seven Shot 49 NM CO	145 185 50	380	Castable	Shotcreting	From outside the furnace
28	2016	Russia	Novolipetsk Iron & Steel	Lipetsk	6	3.200	12,0	9.000	Capital relining	Hearth in cooperation with SGL Carbon Bosh with precasted cooling staves Belly - Stack Uncooled part of Stack	RDN (SGL Carbon) 7RDN (SGL Carbon) RST 16 ECO (SGL Carbon) RST 17 ECO (SGL Carbon) RST 18 ECO (SGL Carbon) Seven Cast 71 NB 01 Y -10 Seven Shot 75 NB 01 X Seven Shot 65 NH CO Seven Shot 65 NH CO Seven Shot 49 NM CO Seven Cast 3462 UR Seven Gun 80 K SIC Plast Seven Grout 55 NM Seven Plast 90 AKR Seven Ram 82 XK	441 21 85 10 1 107 184 148 115 38 5 42 68 23 36	558	Carbon blocks Microporous carbon blocks Ramming Ramming Ramming	Ramming Ramming Ramming	By lifting platform
29	2016	Russia	EVRAZ - ZSMK	Novokuznetsk	3	3.000	11,6	6.500	Partial relining	Belly Stack	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	69 352	421	Castable Castable	Shotcreting Shotcreting	Robotic installation
30	2016	Russia	Novolipetsk Iron & Steel	Lipetsk	4	2.000	10,0	6.000	Injection inside the furnace	Tuyeres - Bosh - Stack	Seven Grout 55 NM-1	4	4	Grouting	Pumping	From outside the furnace
31	2016	Ukraine	PJSC Azovstal Iron & Steel Works	Mariupol	2	1.719	9,1	3.150	Partial relining	Stack (cooled/uncooled) Belly	Seven Shot 62 NH CO Seven Shot 30 N SIC H -3	248 462	710	Castable	Shotcreting	Robotic installation
32	2017	Brazil	Gerda	Divinópolis	2			600	Partial Relining	Low Shaft, Belly and Bosh	Carisit Shot 58 B20-5-BR	40	40	Castable	Shotcreting	Fixed Platform
33	2017	Russia	MMK	Magnitogorsk	10	2.014	10,0	4.500	Capital relining	Bosh - Belly Stack with precasted cooling staves Uncooled part of Stack	Seven Shot 75 NB 01 X Seven Cast 60 NH CO Seven Shot 60 NH CO Seven Shot 49 NM CO Seven Gun 80 K SIC Plast Seven Plast 4355 KR Seven Grout 55 NM Seven Grout 60 NH -3	406 276 22 394 61 12 31 93	1.295	Castable	Shotcreting Vibrating cast Shotcreting Shotcreting	By lifting platform
34	2017	Russia	EVRAZ - ZSMK	Novokuznetsk	2	2.000	9,8	5.400	Injection inside the furnace	Stack - Belly	Seven Grout 45 CM-3 Seven Shot 65 N SIC -3 Seven Shot 50 NH CO	19 196 160	19	Grouting	Pumping	From outside the furnace
35	2017	Ukraine	MMK	Mariupol	3	2.000	9,6	3.700	Partial relining	Stack - Belly - Bosh	Seven Shot 49 NM CO Seven Cast 65 N SIC Seven Shot 65 N SIC Seven Shot 60 NH CO Seven Gun 80 K SIC Plast Seven Grout 55 NM	40 76 194 253 9 10	396	Castable	Shotcreting	Robotic installation
36	2017	Russia	NLMK	Lipetsk	7	4.200	13,2	12.500	Capital relining	Tuyeres - Belly - Stack Bosh with precasted cooling staves Uncooled part of Stack	Seven Shot 60 NH CO Seven Gun 80 K SIC Plast Seven Grout 55 NM	76 194 253 9 10	542	Castable	Shotcreting Shotcreting Shotcreting	By lifting platform
37	2017	Slovakia	US Steel	Kosice	2	2.550	11,0	5.500	Partial relining	Upper stack (uncooled) Armoured plates Burden capping	Seven Shot 60 NH CO Sevenlite 1100	223 8	231	Castable Castable	Shotcreting Gunning	By lifting platform
38	2017	Russia	Tulachermet	Tula	3	2.200	9,0	4.250	Partial relining	Stack - Belly - Bosh	Seven Shot 75 NB 01X Seven Shot 65 N SIC Seven Shot 60 NH CO	168 153 405	727	Castable	Shotcreting	By lifting platform
39	2017	Ukraine	PJSC Azovstal Iron & Steel Works	Mariupol	4	2.000	9,9	3.500	Partial relining	Stack - Belly - Bosh	Seven Shot 65 N SIC -3 Seven Shot 50 NH CO Seven Shot 49 NM CO	416 135 35	586	Castable	Shotcreting	Robotic installation
40	2018	Brazil	Usiminas	Ipatinga	1	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carisit Sol Inject B15 1 BR	30	30	Grouting (refr/burden)	Pumping	From outside the furnace
41	2018	Brazil	Usiminas	Ipatinga	2	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carisit Sol Inject B15 1 BR	30	30	Grouting (refr/burden)	Pumping	From outside the furnace



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42	2018	India	Essar Steel Ltd.	Hazira	Corex 2	2.260	7,3	1.800	Monolithic Hearth Repair	Hearth Tuyeres belt Stack (melter gasifier)	Seven Cast 70 NH CO Seven Cast 2770 UB Seven Cast 3262 UB Seven Shot 75 NB 01 X Seven Shot 96 NR Seven Shot 65 N SIC -3 Seven Shot 49 NM CO	23 85 101 74 28 97 23	431	Castable	Casting Shotcreting	From inside the hearth Robotic installation	
43	2018	Russia	MMK	Magnitogorsk	1	1.370	8,4	3.750	Partial relining	Hearth Stack - Belly - Bosh	Seven Grout 60 NH -3 Seven Grout 55 NM -1 Seven Shot 60 NH CO Seven Cast 60 NH CO Seven Shot 75 NB 01 X Seven Gun 80 K SIC PLAST Seven Gun 70 KH Plast	35 33 293 227 63 37 18	706	Grouting Castable Plastic	Pumping Pumping Shotcreting Vibrating cast Shotcreting Gunning	From outside the furnace From outside the furnace By lifting platform	
44	2018	India	Essar Steel Ltd.	Hazira	Corex 1	2.260	7,3	1.800	Monolithic Hearth Repair	Hearth Tuyeres belt Stack (melter gasifier)	Seven Cast 70 NH CO Seven Cast 2770 UB Seven Cast 3262 UB Seven Shot 75 NB 01 X Seven Shot 96 NR Seven Shot 65 N SIC -3 Seven Shot 50 NH CO	25 108 77 90 50 130 25	505	Castable	Casting Shotcreting Shotcreting	From inside the hearth Robotic installation	
45	2018	Ukraine	PJSC Dniprovsky Metallurgical Kombinat (DMK)	Dneprodzerzhinsk	1M	1.500	8,4	3.000	Partial relining	Stack - Belly - Bosh Backstaves filling Staves sealing	Seven Shot 30 N SIC H -3 Seven Shot 65 NH CO Seven Shot 50 NH CO Seven Grout 48 NM -3 Seven Plast 70 CH CO	154 126 60 67 14	421	Castable Grouting Plastic	Shotcreting Pumping Ramming	By lifting platform From outside the furnace By lifting platform	
46	2018	Ukraine	MMK Ilcha	Mariupol	5	2.300	12,6	3.800	Partial relining	Stack - Bosh	Seven Shot 67 N SIC -3 Seven Shot 50 NH CO	608 36	644	Castable	Shotcreting	By lifting platform	
47	2018	Ukraine	PJSC Azovstal Iron & Steel Works	Mariupol	4	2.000	9,9	3.500	Partial relining	Stack - Bosh	Seven Shot 30 N SIC H -3 Seven Shot 65 NH CO Seven Shot 50 NH CO	68 35 103	206	Castable	Shotcreting	By lifting platform	
48		Ukraine	MMK Ilcha	Mariupol	4	2.000	9,9	3.500	Partial relining	Stack - Belly - Bosh	Seven Shot 67 N SIC -3 Seven Shot 50 NH CO	380 35	415	Castable	Shotcreting	Robotic installation	
49		Russia	NLMK	Lipetsk	6	3.200	12,0	9.000	Injection inside the furnace	Stack - Bosh	Seven Grout 55 NM -1 Seven Grout 84 CB	3 6	9	Grouting	Pumping	From outside the furnace	
50	2019	Brazil	CSN (Companhia Siderurgica Nacional)	Volta Redonda	3	4.237	13,5	8.000	Total Repair	Upper and Medium Shaft	Compac Shot 868-5-BR	360	360	Castable	Shotcreting	Lifting Platform	
51	2019	Brazil	Usiminas	Ipatinga	1	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carisil Sol Inject B15-1-BR	30		Grouting (refr/burden)	Pumping	From outside the furnace	
52	2019	Brazil	Usiminas	Ipatinga	2	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carisil Sol Inject B15-1-BR	30		Grouting (refr/burden)	Pumping	From outside the furnace	
53	2019	Brazil	Usiminas	Ipatinga	3	3.163	12,9	8.000	Inject inside the furnace	Medium shaft	Carisil Sol Inject B15-1-BR	20		Grouting (refr/burden)	Pumping	From outside the furnace	
54	2019	Brazil	CSN (Companhia Siderurgica Nacional)	Volta Redonda	3	4.237	13,5	8.000	Inject inside the furnace	Medium and Upper Shaft	Inject F61-2-BR	100		Grouting (shell/staves)	Pumping	From outside the furnace	
55	2019	Russia	NLMK	Lipetsk	6	3.200	12,0	9.000	Injection inside the furnace	Stack	Seven Grout 84 CB	15	15	Grouting	Pumping	From outside the furnace	
56	2019	Russia	NLMK	Lipetsk	7	4.200	13,2	12.500	Partial relining	Cooling Staves	Seven Shot 65 N SIC Seven Shot 65 N SIC Plast Seven Grout 55 NM-1	27 23 44	499	Castable	Shotcreting	By lifting platform	
										Cooling Staves, Uncooled part of Stack, Dome	Seven Shot 60 NH CO	178		Castable	Shotcreting		From outside the furnace
										Downward gas pipeline of dirty gas, Gas pipeline of semi-clean gas	Seven Gun 63 RH CO	199		Castable	Gunning		
										Axial Cyclone	Seven Gun 38 RM	28		Castable	Gunning		
										57	2019	India		Jayswal Neco	Raipur	BF	650
58	2019	Russia	Severstal	Cerepovec	5	5.580	15,1	12.800	Partial relining	Uncooled part of Stack	Seven Shot 60 NH CO	100	100	castable	Shotcreting	Robotic installation	
59	2019	Kazakhstan	AM Temirtau	Temirtau	3	3.800	13,5	5.000	Partial relining	Stack	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	397 275	672	Castable	Shotcreting	Robotic installation	
60	2019	Ukraine	MMK Ilcha	Mariupol	2	1.720	7,6	3.000	Partial relining	Stack - Belly-Bosh	Seven Shot 67 N SIC -3 Seven Shot 60 NH CO Seven Shot 50 NH CO	107 264 41	412	Castable	Shotcreting	Robotic installation	
61	2019	Ukraine	PJSC Azovstal Iron & Steel Works	Mariupol	2	1.719	9,1	3.150	Partial relining	Stack-Belly-Bosh	Seven Shot 67 N SIC -3 Seven Shot 60 NH CO	527 107	634	Castable	Shotcreting	Robotic installation	



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62	2020	Brazil	Usiminas	Ipatinga	1	885	7,5	2.000	Total Relining	Hearth Tuyeres Low and Medium Stack	Carst Shot SB TC K19-8-BR Carst Shot SB TC K19-8-BR Carst Shot SB B20-5-BR	30 30 50	110	Castable	Shotcreting	Fixed Platform
63	2020	Brazil	Usiminas	Ipatinga	1	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carst Sol Inject B15-1-BR	30	30	Grouting (refr/burden)	Pumping	From outside the furnace
64	2020	Brazil	Usiminas	Ipatinga	2	885	7,5	2.000	Inject inside the furnace	Bosh and Belly	Carst Sol Inject B15-1-BR	30	30	Grouting (refr/burden)	Pumping	From outside the furnace
65	2020	Brazil	Aperam	Timóteo	1		6,8	500	Inject inside the furnace	Bosh and Belly	Carst Sol Inject B15-1-BR	30	30	Grouting (refr/burden)	Pumping	From outside the furnace
66	2020	Brazil	Usiminas	Ipatinga	3	3.163	12,9	8.000	Inject inside the furnace	Medium shaft	Carst Sol Inject B15-1-BR	20	20	Grouting (refr/burden)	Pumping	From outside the furnace
67	2020	Ukraine	MMK ILIHA	Mariupol	3	2.000	9,6	3.700	Partial relining	Stack - Belly - Bosh	Seven Shot 67 N SIC -3 Seven Shot 60 NH CO Seven Shot 50 NHCO	115 350 200	665	Castable	Shotcreting	By lifting platform
68	2020	Russia	Tulachermet	Tula	3	2.200	9,0	4.250	Partial relining	Stack - Belly - Bosh	Seven Shot 75 NB 01X Seven Shot 65 N SIC Seven Shot 60 NH CO	168 153 405	727	Castable	Shotcreting	By lifting platform
69	2020	Ukraine	MMK Ilich	Mariupol	4	2.000	9,9	3.500	Partial relining	Stack - Belly-Bosh	Seven Shot 67 N SIC -3 Seven Shot 60 NH CO Seven Shot 50 NH CO	147 435 50	632	Castable	Shotcreting	Robotic installation
70	2020	Russia	NTMK	Evrz	6	2.200	10,0	7.000	New lining	Stack - Belly - Bosh	Seven Shot 62 NH 01 X Seven Shot 60 NH CO Seven Grout 60 NH -1	295 129 180	604	Castable	Shotcreting	From inside the furnace
71	2020	India	Tata Metaliks	Kharagpur	MBF2	280		850	Monolithic Hearth Repair	Hearth Tuyeres belt	DS Shot 50 NM CO DS Shot 75 NB 01 X DS Shot 65 N SIC -3		156	Castable	Shotcreting Vibrating cast Vibrating cast	From inside the hearth
72	2020	Russia	MMK	Magnitogorsk	2	1370	8,4	3.460	Capital relining	Bosh - Belly Stack with precasted cooling staves Uncooled part of Stack	Seven Shot 75 NB 01 X Seven Cast 60 NH CO Seven Shot 60 NH CO Seven Cast 71 NB 01 Y -10 Seven Gun 80 K SIC Plast Seven Gun 70 KH Plast Seven Grout 55 NM-1 Ready Shapes for Hearth	103 97 353 99 27 15 28 300	1.022	Castable Plastic Plastic Grouting Ready Shapes	Shotcreting Vibrating cast Shotcreting Casting Gunning Gunning Pumping MHS	From inside the furnace By lifting platform From outside the furnace MHS (Ceramic Cap)
73	2020	Kazakhstan	AM Temirtau	Temirtau	4	3179	12,0	5.000	Partial relining	Stack - Belly - Bosh	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	202 560	762	Castable	Shotcreting	Robotic installation
74	2020	Russia	Tulachermet	Tula	1	1.500	8,4	3.000	Capital relining	Stack - Belly - Bosh	Seven Cast 3462 UR Seven Shot 65 N SIC -3 Plast Seven Shot 60 NH CO Seven Grout 55 NM-1 Seven Flow 38 NM-4 Ready Shapes for Hearth Seven Flow 58 NH 01 X-3 Plast Seven Flow 92 NR 08 Z Seven Shot 75 NB 01 X	2 30 190 163 83 123 25 1 10	628	Castable Grouting Ready Shapes Grouting Castable	Vibrating cast Shotcreting Pumping MHS Pumping Casting Shotcreting	By lifting platform From outside the furnace Modular Hearth Shield (Ceramic Cup)
75	2020	Ukraine	MMK Ilich	Mariupol	2	1.720	7,8	3.000	Partial relining	Stack - Belly - Bosh	Seven Shot 67 N SIC -3 Seven Shot 60 NH CO Seven Shot 50 NH CO	110 270 42	422	Castable	Shotcreting	Robotic installation
76	2020	Russia	MMK	Magnitogorsk	9	2.014	10,0	4.500	Partial relining	Lower/middle stack	Seven Shot 75 NB 01 X Seven Shot 60 NH CO Seven Flow 85 N SIC -3	190 70 30	290	Castable	Shotcreting	Robotic installation
77	2021	Brazil	Usiminas	Ipatinga	2	885	7,5	2.000	Total Relining	Lower and Middle Stack	Carst Shot SB B20-5-BR	180	180	Castable	Self-Flowing	From outside the furnace
78	2021	Brazil	Usiminas	Ipatinga	3	3.163	12,9	8.000	Inject inside the furnace	Middle Stack	Carst Sol Inject B15-1-BR	20	20	Grouting (refr/burden)	Pumping	Fixed Platform
79	2021	Ukraine	MMK Ilich	Mariupol	3	2.000	9,6	3.700	Partial relining	Stack - Belly - Bosh	Seven Shot 67 N SIC -3 Seven Shot 62 NH 01 W Seven Shot 50 NH CO	96 317 71	484	Castable	Shotcreting	By lifting platform
80	2021	Italy	Arceor Mittal Italia	Taranto	2	2.008	9,6	5.200	Full relining	Tuyeres Belt Stack - Belly - Bosh Dome	Seven Shot 75 NB 01 X Seven Shot 65 N SIC -3 Seven Shot 60 NH CO Alogun BF 525	52 479 199 27	757	Castable	Shotcreting	From inside the furnace
81	2021	Ukraine	MMK Ilich	Mariupol	5	2.000	9,6	3.700	Partial relining	Stack - Belly - Bosh	Seven Shot 67 N SIC -3 Seven Shot 62 NH 01 W Seven Shot 50 NH CO	131 222 209	562	Castable	Shotcreting	By lifting platform
82	2021	Russia	Severstal	Cerepovec	5	5.580	15,1	12.800	Partial relining	Uncooled part of Stack	Seven Shot 60 NH CO	100	100	Castable	Shotcreting	Robotic installation
83	2021	Colombia	Acerio PazDelRio	Sogamoso	Elena	850	6	1.000	Partial relining	Stack - Belly - Bosh	Seven Shot 60 NH CO Seven Shot 62 NH 01 W Seven Shot 75 NB 01 X	100 24 60	184	Castable	Shotcreting	Robotic installation



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84	2021	Kazakhstan	AM Temirtau	Temirtau	2	2.465	9,8	3.000	Partial relining	Stack - Belly - Bosh	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	202 299	501	Castable	Shotcreting	Robotic installation
85	2021	Italy	Arcelor Mittal Italia	Taranto	4	2.500	10,6	5.500	Partial relining	Tuyeres Belt	Seven Shot 75 NB 01 X Seven Grout 48 NM-3	61 118	319	Castable	Casting	From inside the furnace
										Bosh	Seven Plast 85 AK SIC -3 Seven Shot 60 NH CO	10 120		Plastic	Ramming	
										Dome	Seven Gun 50 RM 5 CO Seven Shot 75 NB 01 X	10 165		Castable	Shotcreting	By lifting platform
86	2021	Russia	Tulachermet	Tula	2	1234	8,3	2.500	Monolithic Hearth Repair & Capital relining	Tuyere Belt	Seven Shot 65 N SIC Seven Shot 60 NH CO	182 300	1.195	Castable	Shotcreting	By lifting platform
										Belly - Bosh	Seven Gun 60 KH Plast Seven Shot 65 N SIC - 3 Plast	10 25			Gunning	
										Stack (cooled / uncooled)	Seven Shot 48 NM - 3 Seven Flow 38 NM 4	33 21		Grouting	Pumping	From outside the furnace
										Sealing of cooling staves	Seven Grout 48 55 NM - 1 Seven Shot 80 N SIC - 3	6 124			Shotcreting	Monolithic Hearth Side-Wall & Taphole-Area Bottom Levelling
										Grouting	Seven Shot 1775 UB Seven Shot 2671 UB	190 135		Castable	Shotcreting	
										Back Layer	Seven Cast 3462 UR	4			Casting	
87	2022	Brazil	Vallourec	Jeceaba	2	350	4,2	900	Total Relining	Tuyeres, Belly and Bosh	Carist Shot 58 TC K19-8-BR	80	120	Castable	Shotcreting	Lifting Platform
88	2022	Brazil	Usiminas	Ipatinga	3	3.163	12,9	8.000	Inject inside the furnace	Upper Stack	Compac Shot B68-5-BR	40	20	Grouting (refr/burden)	Pumping	From outside the furnace
89	2022	Turkey	Erdemir Celik	Eregli	2	1.707	9,7	4.800	Partial relining	Medium Stack	Carist Sol Inject D15-3-BR	20	500	Castable	Shotcreting	Robotic installation
90	2022	Colombia	Acerio PazDelRio	Sogamoso	Elena	850	6	1.000	Partial relining	Stack - Belly - Bosh	Seven Shot 60 NH CO Seven Shot 75 NB 01 X	380 120	286	Castable	Shotcreting	Manually & Robotic installation
91	2022	Kazakhstan	AM Temirtau	Temirtau	3	3.800	13,5	5.000	Partial relining	Tuyere Belt	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	267 331	598	Castable	Shotcreting	Robotic installation
92	2022	Italy	Acciaierie d'Italia S.p.A.	Taranto	2	2.026	9,6	5.200	Full relining	Stack - Belly-Bosh	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	267 331	733	Castable	Shotcreting	From inside the furnace
										Bosh	Seven Shot 65 N SIC-3	116		Castable	Gunning	
										Belly-Stack-Dome	Seven Shot 60 NH CO	567			Shotcreting	By lifting platform
93	2022	Russia	MMK	Magnitogorsk	10	2.014	10,0	4.500	Full Relining	Bosh	Seven Shot 75 NB 01 X SevenShot 62 NH 01X	82 349	1.141	Castable	Shotcreting	By lifting platform
										Belly	Seven Shot 60 NH CO Seven Shot 50 NH CO	173 434			Shotcreting	
										Lower/middle stack	Seven Shot 70 NH CO Plast	11		Plastic	Shotcreting	
										Upper Stack / Uncooled	Seven Shot 65 N SIC-3 Plast	35		Plastic	Shotcreting	
										Comp. Joint Stack/Armour	Seven Grout 60 NH -1	57		Grouting	Pumping	From outside the furnace
										Sealing of cooling staves	DS Shot 75 NB 01 X DS Shot 62 NH 01 W		143	Castable	Shotcreting	By lifting platform
94	2022	India	Tata Metaliks	Kharagpur	MBF2	280		850	Partial relining	Cooling staves backfilling	DS Shot 75 NB 01 X DS Shot 62 NH 01 W		214	Castable	Shotcreting	By lifting platform
95	2022	India	Tata Metaliks	Kharagpur	MBF1	260		800	Partial relining	Stack	DS Shot 75 NB 01 X DS Shot 62 NH 01 W			Castable	Shotcreting	
96	2022	Russia	MMK	Magnitogorsk	9	2014	10,0	4.500	Capital relining	Tuyere Belt	Seven Shot 62 NH 01 X	200	1.324	Castable	Shotcreting	By lifting platform
										Boswh / Belly	Seven Cast 60 NH CO	227			Prefabricated Staves	
										Lower Stack	Seven Shot 50 NH CO	420		Grouting	Shotcreting	From outside the furnace
										Middle / Upper Stack	Seven Grout 48 NM - 3	44		Castable	Gunning	By lifting platform
										Stack Uncooled Part	Seven Gun 65 KM Plast	18		Castable	Shotcreting	
										Grouting	Seven Shot 65 N SIC-3 Plast	50		Ready Shapes	Prefabricated Blocks MHS	Modular Hearth Shield (MHS)
										Comp. Joint Stack/Armour	Seven Block KK 80	199				
										Sealing of cooling staves	Seven Block KK 8010	166				
										Bottom Blocks	Seven Shot 60 NH CO	102				
97	2022	Russia	Mechel Cheliabinsk	Cheliabinsk	1	2.034	9,8	3.300	Partial relining	Upper Stack	Seven Shot 60 NH CO Seven Shot 60 NH CO	55 57	256	Castable	Shotcreting	By lifting platform
										Armour Area	Seven Flow 38 NM4	42		Grouting	Pumping	From outside the furnace
										Dome / Gas Take Off	Seven Shot 2671 UB	87				
										Grouting behind Armour P.	Seven Shot 75 NB 01 X	93		Castable	Shotcreting	By lifting platform
98	2022	Russia	Tulachermet	Tula	3	2.200	9,0	4.250	Capital relining	Tuyere Area	Seven Shot 75 NB 01 X Seven Shot 60 NH CO	277 400	1.004	Castable	Shotcreting	By lifting platform
										Bosh / Belly	Seven Shot 60 NH CO Seven Shot NH CO Plast	30 16		Plastic	Shotcreting	
										Stack	Seven Shot 65 N SIC - 3 Plast	39		Plastic	Shotcreting	
										Armour Area / Dome	Seven Grout 48 NM -3	62		Grouting	Pumping	From outside the furnace
										Comp. Joint Stack/Armour	DS Shot 75 NB 01 X DS Shot 62 NH 01 W		142	Castable	Shotcreting	By lifting platform
99	2022	India	Rashmi Metaliks	Kharagpur	MBF1	330		900	Partial relining	Sealing of cooling staves	DS Shot 75 NB 01 X DS Shot 62 NH 01 W			Castable	Shotcreting	
100	2022	Russia	MMK	Magnitogorsk	8	1.370	8,4	3.400	Partial relining	Cooling staves backfilling	Seven Shot 60 NH CO	185	185	Castable	Shotcreting	Robotic Installation



REFERENCE LIST - BLAST FURNACE REPAIR

#	Year	Country	Company	Works	BF #	Working Volume [m3]	Hearth Diameter [m]	Daily Production [tHM / day]	Scope	BF Section	Product used	Qty [ton]	Total Qty [ton]	Product Type	Technology	Installation Technique
101	2023	Brazil	AMIF	Juiz de Fora	1	250	4,3	600	Partial Relining	Upper Stack	Carisit Shot B11-S-BR	40	40	Castable	Shotcreting	Robotic Installation
102	2023	Brazil	AMIF	Juiz de Fora	2	250	4,3	600	Partial Relining	Upper Stack	Carisit Shot B11-S-BR	40	40	Castable	Shotcreting	Robotic Installation
103	2023	Brazil	Usiminas	Ipatinga	3	3.163	7,5	8.000	Hearth	Hearth	Carisit Shot SB TC K19-8-BR	120	120	Castable	Shotcreting	Fixed Platform
104	2023	Russia	Mechel Cheliabinsk	Cheliabinsk	4	2.034	9,8	4.500	Partial relining	Uncooled part of Stack	Seven Shot 60 NH CO	221	221	Castable	Shotcreting	Robotic Installation
105	2023	Romania	Liberty Steel	Galati	5	3.120	12.0	6.500	Partial relining	Tuyere Belt Belly and Stack Upper Stack, Armor Area	Seven Shot 75 NB 01 X Seven Shot 60 NH CO Seven Shot 50 NH CO	55 159 29	243	Castable	Shotcreting	Manually at Tuyere Level & Robotic installation at Belly and Stack
106	2023	India	Ind Synergy	Raigarh	MBF	250		700	Partial relining	Stack	D5 Shot 62 NH 01 W D5 Shot 62 NH CO		72	Castable	Shotcreting	Manual shotcreting from platform. Sacrificial layer on bricks.
107	2023	India	ESL (Electro Steel Ltd)	Bokaro	2	1.250		3.200	Partial relining	Belly and Stack	D5 Shot 60 NH CO	130	130	Castable	Shotcreting	Robotic installation
108	2023	Poland	Arceilor Mittal	Katowice	2		12,0	5.000	Partial relining	Belly and Stack	Seven Shot 60 NH CO	280	280	Castable	Shotcreting	By lifting platform
109	2024	Brazil	Aperam	Timóteo	2			1.100	Partial Relining	Low, Medium and Upper Stack	Carisit Shot B11-S-BR	100	100	Castable	Shotcreting	Robotic Installation
110	2024	Brazil	AMIF	Juiz de Fora	2	250	4,3	600	Partial Relining	Upper Stack	Carisit Shot B11-S-BR	30	30	Castable	Shotcreting	Robotic Installation
111	2024	Brazil	AMIF	Juiz de Fora	1	250	4,3	600	Partial Relining	Upper Stack	Carisit Shot B11-S-BR	30	30	Castable	Shotcreting	Robotic Installation
112	2024	India	BMM Ispat	Hospet	BF	680		2.200	Partial relining	Stack	D5 Shot 60 NH CO	80	80	Castable	Shotcreting	Robotic installation
113	2024	Slovakia	US Steel	Kosice	1	1.845	10,0	4.000	Partial relining	Bosh, Bellyy, Low & Medium Stack	Seven Shot 65 N SIC -3 Seven Shot 62 NH 01 X	102 85	187	Castable	Shotcreting	By lifting platform
114	2024	Italy	Acciaierie d'Italia S.p.A.	Taranto	1	2.026	9,6	5.200	Full relining	Tuyeres belt Bosh, Belly, Stack Dome	Seven Shot 75 NB 01 X Seven Shot 65 N SIC -3 Seven Shot 60 NH CO Seven Gun 50 RM 5 CO	30 330 230 10	600	Castable	Shotcreting	By lifting platform
115	2024	India	Vedanta Sesa Goa	Goa	3	549	6,1	1.700	Full relining	Bosh, Belly, Stack	D5 Shot 60 NH CO	87	87	Castable	Shotcreting	Robotic installation
116	2024	Austria	Voestalpine	Donawitz	4	1.343	8,0	2.100	Sacrificial Layer	Bosh	Seven Shot 60 NH CO	15	15	Castable	Shotgunning	By lifting platform
117	2025	India	Tata Steel	Gamharia	MBF	245	4,2	850	Monolithic Hearth Repair and Partial Relining	Hearth bottom Hearth Sidewall Tuyeres Belt Lower Stack	D5 Shot 65 N SIC -3 D5 Shot 70 NH CO D5 Shot 2770 UB D5 Shot 3262 UB D5 Shot 75 NB 01 X D5 Shot 50 NH CO	12 12 50 47 30 43	194	Castable	Vibrating cast	From inside the furnace
118	2025	India	KFIL	Kirlogar	MBF1	290		700	Partial relining	Stack & Dome	Compac Shot M61-6-K-IN	115	115	Castable	Shotcreting	Robotic installation
119	2025	Italy	Acciaierie d'Italia S.p.A.	Taranto	2	2.008	9,6	5.200	Partial relining	Bosh, Belly Stack	Seven Shot 75 NB 01 X Seven Shot 65 N SIC -3 Seven Shot 60 NH CO Seven Cast 3262 UB Seven Shot 80 N SIC - 3	90 250 200 692 140	540	Castable	Shotcreting	By lifting platform
120	2025	Ukraine	Kamet Steel PJSC	Kamenske City	9	1.386	7,8	2.800	Monolithic Hearth Repair and Partial Relining	Hearth bottom Hearth Sidewall Tuyeres Belt Lower / Middle / Upper Stack	Seven Grout 60 NH -3 Seven Plast 85 AK SIC -3 Seven Gun 65 RM Seven Shot 67 N SIC -3 Seven Shot 65 NH CO	33 18 22 356 150	1411	Castable	Vibrating cast	From inside the furnace
121	2025	Germany	AM Eisenhüttenstadt	Eisenhüttenstadt	5A	1.870	9,8	5.500	Partial relining	Middle / Upper Stack	Seven Shot 60 NH CO	144	144	Castable	Shotcreting	Robotic installation
122	2025	India	JSW - Jindal South West	Bellary	Corex 2	2.000		2.200	Partial relining	Stack - Melter Gasifier	Compac Shot M61-6-K-IN	180	180	Castable	Shotcreting	Robotic installation
123	2025	Italy	Acciaierie d'Italia S.p.A.	Taranto	4	2.430	10,6	5.400	Partial relining	Middle / Upper Stack	Seven Shot 60 NH CO	190	190	Castable	Shotcreting	Robotic installation
124	2025	Slovakia	USS	Kosice	2	2.550	11,0	5.500	Partial relining	Tuyeres Belt / Bosh Upper Stack / Armour Plates	Seven Shot 62 NH 01 X Seven Shot 62 NH CO	48 122	170	Castable	Shotcreting	By lifting platform
125	2025	Italy	Acciaierie d'Italia S.p.A.	Taranto	4	2.430	10,6	5.400	Partial relining	Middle / Upper Stack	Seven Shot 60 NH CO	210	210	Castable	Shotcreting	Robotic installation