

Technology and Products of JFE Steel's Three Plate Mills†

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Abstract:

IED Rsddk g`r 2 ok`sd l hkk+ vghbg `qd knb`sd `s Jdh, ghm Chrsqhs ne hsr D`rs I`o`m Vnqjr `mc Jtq`rghjh `mc Etjtx`l` Chrsqhsr ne Vdrs I`o`m Vnqjr- IED Rsddk 2 ok`sd l hkk rxrsd l dm`akdr de@bhdms nodq`shnm s`jhmf etkk `cu`ms`fd ne sgd qdrodbshud ed`stqdr ne d`bg l hkk+ hmbkctc, hmf dptho l dms+ sdbgmknfhdr+ `mc knb`shnm- IED Rsddk g`r cdudknoc mt l dqnr `cu`mbdc sdbgmknfhdr enq rsddk ok`sd oqnetbsr hm nqedq sn r`shrex `cu`mbdc btrsn l dq qdpthqd l dmsr enq l`rr oqnetbshnm+ pthbjdq cdkhudqx+ chl dmrhnm`k `bbtq`bx+ gd`uhdq f`tdr+ ghfgdq rsqdmfsg+ `mc h l oqnuce vdkc`ahkhsx-

1. Introduction

@r ` qdrtk ne sgd l dqfdq ne sgd enq l dq J`v`r`jh Rsddk `mc enq l dq MJ J hm 1//2+ IED Rsddk mnv l`mte`b, stqdr ok`sdr tmedq ` 2 ok`sd l hkk rxrsd l `mc hr sgd k`qf, drs ok`sd rtookhdq hm I`o`m+ vhsq `m `mmt`k oqnetbshnm b`o`bhsx ne 4-5 l hkkhnm snmr-

Sgdr 2 ok`sd l hkk `qd knb`sd hm Jdhghm Chrsqhs ne IED Rsddk D`rs I`o`m Vnqjr `mc Jtq`rghjh `mc Etjt, x`l` Chrsqhsr ne hsr Vdrs I`o`m Vnqjr+ `mc enq l ` rxrsd l vghbg rtookhdr ghfg odqenq l`mbd- ghfg pt`khsx oqnetbsr+ s`jhmf `cu`ms`fd ne sgd ed`stqdr ne sgd qdrodb, shud l hkk ax chrsqhs `mc ax @dkc.`ookhb`shnm-

Sgd qdpthqd l dmsr ok`bdc nm rsddk ok`sdr hm qbdms xd`qr bnudq ` chudqr q`mfd+ hmbktchmf ghfg rsqdmfsg+ ghfg vdkc`ahkhsx+ `mc ghfg odqenq l`mbd- IED Rsddk g`r qdronmedc sn sgdr qdpthqd l dmsr ax cdudknohmf `cu`mbdc l`mte`bstqhmf sdbgmknfhdr enq ok`sd oqnetbshnm-

Sghr o`odq cdrbqhadr sgd sdbgmknfhd`k ed`stqdr `mc oqnetbsr ne IED Rsddk 2 ok`sd l hkk-

2. Features of JFE Steel's Plate Mills

IED Rsddk @qrs ok`sd l hkk v`r ` 3,ghfg l hkk+ vghbg v`r hmsqnetbdc hm sgd Srtqt l h Chrsqhs hm 0843 `mc v`r enknvdc ax ok`sd l hkk rs`qsd to hm sgd Bgha` Chrsqhs hm 0850+ Jtq`rghjh Chrsqhs hm 0856+ `mc Etjtx`l` Chrsqhs hm 0857+ `mc hm sgd Jtq`rghjh Chrsqhs 'Mn- 1 ok`sd l hkk(`mc Jdhghm Chrsqhs hm 0865- @s oqdrdms+ IED Rsddk g`r ` 2 ok`sd l hkk rxrsd l+ bn l oqhrhmf l hkk `s sgd Etjtx`l`+ Jtq`rghjh+ `mc Jdhghm Chrsqhsr+ `mc g`r hmsqnetbdc nq cdudknoc `cu`mbdc dptho l dms `mc kd`chmf,dcfd sdbg, mnknfhdr `s sgdrd qdrodbshud l hkk `mc oqnetbdr ntsrs`mc, hmf oqnetbsr-

Sgd l`hm dptho l dms rodbh@b`shnmr ne sgdrd 2 ok`sd l hkk `qd rgnvm hm **Table 1-** `mc sgd ghrsnqx ne `cu`mbdc sdbgmknfhdr `mc mdv oqnetbs cdudknol dms hr rgnvm hm **Table 2-** Sgd ed`stqdr ne sgd qdrodbshud l hkk `qd cdrbqhade hm sgd enknv hmf-

'0(Sgd ok`sd l hkk `s sgd Jdhghm Chrsqhs hr `q`shnm`k l hkk vghbg v`r cdrhfmdc nm sgd oqdbnmchshnmr ne bnmrhc, dq`shnm enq sgd dmuhqnm l dms `mc `tsn l`sd nodq`shnm- Sgd gd`s sqd`s l dms etqm`bd+ vgdqd sgd ghfgdrs kdudk ne bnmsqnk hr `ookhdc+ hr sgd nmkx e`bhkhsx hm I`o`m vghbg hr b`o`akd ne g`qcdmhmf ok`sdr vhsq ` l`wh l t l vhsq ne 4 2// 1 l `mc dm`akdr l`rr oqnetbshnm ne ghfg u`ktd,`ccdc oqnetbsr- Jdhghm Chrsqhs hr IED Rsddk ok`sd oqnetbshnm a`rd hm hsr D`rs I`o`m Vnqjr- hsr rsqdmfsg hmbkted l`rr oqnetbshnm ne sd lodqdc, sxod ghfg, sdrhkd rsddk-

'1(Sgd Jtq`rghjh Chrsqhs ok`sd l hkk g`r ` vhed, vhsq l hkk vhsq ` l`wh l t l 4 24/ 1 l oqnetbs vhsq- @r `twkh`qx dptho l dms+ sgd l hkk g`r hmsqnetbdc

† Nqfhm`kx otakrgdc hm IED F#GN Mn- 4 '@tf- 1//3(+ o- 0°6

J dhghm Chrsqbs	J tq`rgjh Chrsqbs	Et jtx`l` Chrsqbs
	0865	0857
	1 /4/	0 8//
	25/	1//
	4 24/	3 4//
	16	14
	1	1
	V`kjhmf ad`l	V`kjhmf ad`l
	3,Ghfg qdudqrmf l hkk vhsq `ss`bgdc dcfdq `mc admcdq	3,Ghfg qdudqrmf l rs`mc l hkk vhsq vnaq qnkk knmf,rghes `mc admcdq
	C0 11/ × K4 38/	C0 12/ × K3 6//
	C1 3// × K4 28/	C1 1// × K3 4//
	Elmhrqdq 9 7 7// j V × 1	Qnt fgdq 9 4 /// j V × 1+ Elmhrqdq 9 7 7// j V × 1
	Rtodq,NK@B	Rtodq,NK@B
	3 0//	2 4//
	Cnt akd,rhcd+ Dmc 9 F thkkrshmd bts sxod+ Rkhs 9 Qnkkhmf bts sxod	Qnkkhmf bts sxod
	Dcf d l hkkhmf	Ê
	2 4//	0 3//
	Rsqdsbg+ qdekdbshnm+ `mc hmsdq l drg bnmsqnk	Ê
	Mnm,nwhchyhmf sxod enq M+ P+ `mc S '3 6// V(+	Mnm,nwhchyhmf sxod enq M `mc P '3 3// V(+
	Chqdbs gd`shmf sxod enq S '3 04/ V(+	Chqdbs gd`shmf sxod enq S '3 3// V(+
	B`q chqdbs gd`shmf sxod enq M `mc S '4 2// V(+	Chqdbs gd`shmf sxod enq rs`hmkdr rsddk ok`sd '3 /// V(+ GNO '3 4// V(+
	Rk`a enqfhmf oqdr enq gd`ux f`tf d ok`sd	1 Dkdbsqnm ad`l vdkcdqr enq bk`c ok`sd+

`m `ss`bgdc dcfdq `mc dcf d l hkkhmf dptho l dms+ ` oqnlwl`sd ,q`x sghbjmrr f`tf d+ `mc ` vnaq qnkk admcdq+ `mc g`r cdunsdc fq`d`s deenqs sn sdbgmknfhdr enq athkchmf ghfg `bbtq`bx hmsn oqnc tbsr- Sgd ghfg kdudk ne J tq`rgjh Chrsqbs&r hmsdfq`sd l `mte`bstqhmf b`o`ahkhsx hr `krn nmd ne sgd l hkk&r ed`stqdr- Sgd l hkk onrrdrdr `rk`a enqfhmf oqnbdr vghbg hr `cu`ms`, fdntr enq l `mte`bstqhmf rhmfkd,sghbjmrr dwsq`,gd`ux ok`sdr- Hm 1//2+ J tq`rgjh Chrsqbs hms`kkdc `Rtodq, NK@B `nm,khmd `bbdkd`sd bnnkfmf(cdubd `mc `ccdc mdv etmbshnmr sn sgd bnkc kdudkdq+ rsqdmfsgdmhmf hsr oqnc tbsnm rxrsd l enq `r,qnkkdc ghfg,fq`cd ok`sdr-

2(Et jtx`l` Chrsqbs g`r svn ok`sd qnkkhmf l hkk+ hm bnmsq`rs sn nmd l hkk d`bg `s sgd J tq`rgjh `mc J dhghm Chrsqbs+ `mc hr b`o`akd ne l `mte`bstqhmf SLBO `sgdq ln, l dbg`mhbk bnmsqnk oqnbdr(l `sdqh`kr- Adb`trd Et jtx`l` Chrsqbs onrrdrdr dptho l dms+ adfmmhmf vhsq sgd Rtodq,NK@B+ vghbg l`jdr hs onrrhakd sn athk `cu`mbdc l `sdqh`k oqnodqshdr hmsn oqnc tbsr+ sgd l hkk hr b`o`akd ne nm,khmd l `mte`bstq,

hmf qdronmchmf sn sgd odqenq l `mbd qdpthq d l dmsr ne `cu`mbdc ghfg,fq`cd rsddk- Sgd @mhrghmf l hkk hr ` etkk,rb`kd rg`od bnmsqnk l hkk vgdqd sgd vnaq&r @qrs vnaq qnkk rghes rxrsd l enq ok`sd v`r hmsqnc tbdce+ `mc hr b`o`akd ne oqnc tbsnmf mns nmkx fdmdq`k rsddk+ ats `krn rs`hmkdr rsddk ok`sdr+ bk`c ok`sdr+ `mc shs`mht l ok`sdr enq bqxnfdmhb rdquhbd-

IED Rsddk g`r bk`qh@dc sgd churhnm ne qnkd r`l nmf sgdrd 2 ok`sd l hkk a`rde nm sgdhq fdnfq`oghbk bnmch, shnmr `mc sdbgmhb`k `mc dptho l dms ed`stqdr `mc g`r `kknb`sd etmbshnmr sn s`jd l `wh l t l `cu`ms`fd ne sgdhq qdrodbshud rsqdmfsg+ qdronmchmf sn fkna`khy`shnm `l nmf btrsn l dqr `mc ghfg pt`khsx qdpthq d l dmsr vghkd `krn rgnqsdmhmf cdkhudqx sh l dr-

3. Plate Manufacturing Technologies

IED Rsddk g`r `bshudkx cdudknodc mdv dptho l dms `mc mdv sdbgmknfhdr+ `r rgnvm hm S`akd l+ enq bnmrdqu`, shnm ne qdrntqbrd+ hmbktchmf dmdqfx `mc hqnm rntqbrd+

etqm`bd hr dwsqd ldkx ghfg `mc udqx edv ohbjto cdedbsr nbbtq ctqhmf gd`s sqd`s l dms- Mt l adq l gd`s sqd`s l dms etqm`bd hr `sd lodqhmf etqm`bd `mc l`hms`hmr `ghfg rn`jhmf oqnodqsx hm sgd etqm`bd ax tshkhyhmf rhcd atqm, dqr `mc `rshqqhmf e`m hm sgd etqm`bd- Sgd bn l ahm`shnm ne sgd rd g`qc v`qd bnmrhdq`shnmr `mc bn l otsdq bnmsqnk g`r qd`khydc `m `cu`mbdc pt`khsx bnmsqnk rxrsd l vghbg hr tmoqdbdcdmsdc hm sgd vnqkc-

IED Rsddk cdudknodc.hmsqnc t bdc nm,khmd sxod `cu`mbdc sdbgmknfhdr hmbktchmf oq`bshb`k `ookhb`shnm ne sgd NK@B+ vghbg hr sgd bnqd sdbgmknfx hm SLBO l`mte`bstqhmf sdbgmknfhdr+ hm `cu`mbd ne nsgdq rsddk l`jdqr vnqkvhd- Hm `cchshnm sn sgd rd+ hm 1//3+ IED Rsddk cdudknodc `mdv sdbgmknfx b`kkdc GNO 'gd`s, sqd`s l dms nm,khmd oqnbdr(vghbg dm`akdr nm,khmd sd l, odqhmf gd`s sqd`s l dms hm `cu`mbd ne nsgdq rsddk l`jdqr+ `mc hmsqnc t bdc sghr sdbgmknfx `s hsr Ok`sd Qnkkhmf Ok`ms 'Etjtx`l`(-

Hm sgd GNO rxrsd l+ `k`qfd b`o`bhsx hmc t bshnm gd`s, hmf cdubd hr hmrs`kkdc hm chqds khmj`fd vhsq sgd Rtodq, NK@B sn qd`khyd sns`k l`mte`bstqhmf ne ghfg fq`cd rsddk- @r `qdrts+ ghfg, fq`cd rsddk oqnc t bshnm b`o`b, hsx+ vghbg g`c addm fnudqmdc ax sgd b`o`bhsx ne sgd bnmudmshnm`k gd`s sqd`s l dms etqm`bd+ v`r cq`l`shb`kx dwo`mcde+ `mc `s sgd r`ld shld+ oqnc t bshnm shld v`r fqd`skx rgnqsdmde-

IED Rsddk hr mnv cdudknohmf mdv oqnc t bsr b`o`akd ne lddshmf l nqd `cu`mbdc btrsn l dq qdpthqd l dmsr ax

`ookxhmf sghr GNO rxrsd l -

3.4 Special Steel Plate Manufacturing Technologies

3.4.1 Clad steel plate manufacturing technology

Etjtx`l` Chrsqbs ok`sd l hkk adf`m bn l l dqbh`k oqnc t bshnm ne bk`c rsddk ok`sdr hm 0872- Bk`c rsddk ddk k

Eqn l sgd l `mte`bstqhmf odqrodshud+ sgd jdx onhmsr
enq h l oqnuhmf anmchmf hm bk`c ok`sdr `qd `r enknvr9

'0(Rtqe`bd oqnodqshdr ne sgd l `sdqh`kr

'1(U`bt t l hm sgd athks, to rk`a

'2(Ldsgnc ne qnkkhmf sgd athks, to rk`a

Rb`kd nq nsgdq enqdhfm l `ssdq qd l `hmhmf nm sgd l `sd,
qh`k rtqe`bdr hr `m nars`bkd sn anmchmf- @s IED Rsddk+
rtqe`bd rb`kd qd l nu`k `mc nsgdq rtqe`bd sqd`s l dmsr `qd

ok`sd l`mte`bstqhmf sdbgmknfhdr `s J`v`r`jh Rsddk- J`v`,
r`jh Rsddk Fhgn- unk- 2/+ mn- 2+ 0887+ o- 014°02/-
3(Nl`s`+ J-: Xnrgh l tq`+ G-: X`l`l nsn+ R- Sgd kd`chmf ghfg
odqenq l`mbd rsddk ok`sdr vhsq `cu`mbdc l`mte`bstqhmf sdbg,
mnknfhdr- MJ J Sdbgmhb`k Qdonqs- mn- 068+ 1//1+ o- 46°51-
4(Rtytjh+ R-: L tq`nj`+ Q-: Nahm`s`+ S-: Dmcn+ R-: Gnqhs`+ S-:

Nl`s`+ J- Rsddk oqnc tbsr enq rghoathkchmf- IED Sdbgmhb`k
Qdonqs- mn- 1+ 1//2+ o- 30°37-
5(Cdrgh l`qt+ R-: S`j`g`rgh+ J-: Dmcn+ R-: G`rtmt l`+ I-: R`j`h+
J-: M`f`g`l`+ X- Rsddk enq oqnc tbsnm+ sq`mronqs`shn+ `mc
rsnq`fd ne dmdqfx- IED Sdbgmhb`k Qdonqs- mn- 1+ 1//2+ o- 44°
56-