Abstract:

To meet the requirements of higher strength, improved weldability, and higher performance placed on structural steel plates for large-scale structures in recent years while also reducing manufacturing costs, JFE Steel has developed revolutionary plate manufacturing technologies; the Super-OLAC, a next-generation accelerated cooling technology for plates with a high cooling capacity, achieving the theoretical cooling limit, and uniform cooling performance, and the HOP (heat-treatment on-line process), an induction heating-type on-line heat-treatment process which reduces delivery times. Making full use of these plate manufacturing technologies, JFE Steel has developed high quality, high performance plates for a wide range of fields.

1. Introduction

>iqelrde qeb mboclo j^k`b obnrfob j bkqp mi^`ba lk pqbbi mi^qbp fk ob`bkq vb^op afccbo ql pl j b buqbkq abmbka*

qflk^i ^``bibo^qba `llifkd+ J loblsbo) qeb proc^`b qb j* mbo^qrob afpqof_rqflk fk qeb mi^qb %mi^kb& ^cqbo qeb *Super*\* LI>@ pel tp rkfclo j fqv bnr^i ql qe^q lc ^p*oliiba pqbbi mi^qbp) t fqe tef`e ^``bibo^qba `llifkd fp klq mboclo j ba+

@r j ri^qfsb molar`qflk lc ^``bibo^qba `llifkd pqbbi mi^qbp rpfkd qeb *Super**LI>@ bu`bbaba 0 j fiiflk qlkp fk qeb ªopq 2 vb^op ^cqbo pq^oqrm+ Qeb Kl+ / rkfq lc *Super** LI>@ t^p pq^oqba rm ^q GCB Pqbbi$p Tbpq G^m^k Tlohp Hro^pefhf Afpqof`q Mi^qb Oliifkd Mi^kq fk J^v /--0) cliil tba _v Kl+ 0 rkfq ^q qeb B^pq G^m^k Tlohp Hbfefk Afpqof`q Mi^qb Oliifkd Mi^kq fk Griv /--1+ Qerp) ^ii qeobb lc GCB Pqbbi$p mi^qb j fiip ^ob kl t bnrfmmba t fqe pq^qb* lc*qeb*^oq ^``bibo^qba `llifkd bnrfm j bkq+ Fq pelria ^ipl _b klqba qe^q qefp kbt ^``bibo^qba `llifkd qb`eklildv) *Super**LI>@) ob`bfsba qeb Ft^q^kf K^lgf J b j lof^i >t^oa ^ka Lhl`ef J b j lof^i Qb`eklildv >t^oa fk /--/) qeb Pmb`f^i >t^oa lc qeb G^m^k Fkarpqof^i Qb`eklildv Obsfbt @l j j fqqbb fk /--0) ^ka qeb K^qflk^i Fksbkqflk >t^oa fk /--1+

3. New On-Line Heat Treatment Process “HOP”

Ql a^qb) j^krc^`qrob lc nrbk`eba ^ka qb j mboba pqbbi mi^qbp e^p _bbk mboclo j ba lcc*ifkb rpfkd eb^q qob^q j bkq bnrfm j bkq pbm^o^qba col j qeb oliifkd ifkb+ Ql f j molsb bcª`fbk`v _v mboclo j fkd qefp lcc*ifkb qob^q j bkq ^p ^k lk*ifkb mol`bpp) ^k lk*ifkb eb^q qob^q j bkq mol`bpp `^iiba ELM %eb^q*qob^q j bkq lk*ifkb mol`bpp& t^p fkpq^iiba ^ka mrq fkql lmbo^qflk ^q qeb Tbpq G^m^k Tlohp Crhrv^j^ Afpqof`q Mi^qb Oliifkd Mi^kq+

GCB Pqbbi mobsflrpiv absbilmba fkar`qflk eb^qfkd bnrfm j bkq clo olrde _^op t fqe ^ t faqe lc / j) t ef`e fp ^mmifba _bclob qeb ªkfpefkd oliifkd ifkb fk elq oliifkd2&+ El tbsbo) fq t^p kb`bpp^ov ql absbilm ^k rkmob`babkqba kbt i^odb*p`^ib fkar`qflk eb^qfkd ml tbo plro`b clo rpb fk eb^qfkd pqbbi mi^qbp t fqe t faqep lc 1+2 j+ Qeb qb`e* klildv) fk t ef`e j riqfmib rkfqp lc qeb kbt iv*absbilmba efde cobnrbk`v ml tbo plro`b ^ob lmbo^qba pvk`eolklrpiv fk m^o^iibi) t^p ^ ` ] Ş ɔ ^ - D de t ef`e Ş ɔ f kş ba vk] D `qflk

Efde bumb`q^qflkp ^ob mi^``ba lk qeb ELMJ tef`e

%/& Elofwlkq^i Ciburob @l j mbkp^qflk _v Tbadb @lkqoli %Ab«b`qflk @l j mbkp^qflk&

Ciburob lc qeb ibsbifkd oliip fp `^i`ri^qba) ^ka elof*wlkq^i «burob %ab«b`qflk& `l j mbkp^qflk fp mboclo j ba _v ^agrpqfkd p`obt altk ql _b rkfclo j fk qeb mi^qb tfaqe afob`qflk rpfkd tbadbp+

%0& Fkqbo j bpe @lkqoli _v ^ Elia Altk Olii

>k fkqbo j bpe `lkqoli crk`qflk rpfkd ^ elia altk olii t^p fkqolar`ba ql `l j mbkp^qb clo obar`ba p`obt altk^``ro^`v arb ql olii tb^o) bq`+

Figure 9 pel tp qeb afpqof_rqflk lc j^uf j r j _bka*fkd pqo^fk fk qeb mi^qb tfaqe afob`qflk tebk mi^qbp tfqe ^k ^qq^`eba pqo^fk d^rdb tbob ibsbiba tfqe qeb @,I tfqe kbt crk`qflkp+ Qeb kbt crk`qflkp j^hb fq mlppf_ib ql f j m^oq i^odb _bkafkd pqo^fk rkfclo j iv ^`olpp qeb crii tfaqe) bpq^_ifpefkd ^ rkfclo j eb^sv obar`qflk ibsbifkd qb`eklildv clo tfab j^qbof^ip tfqe qeb i^odbpq tfaqe fk qeb tloia %2 02- j j &+

>p abp`of_ba ^_lsb) _v rqfifwfkd qeb rkfclo j `llifkd `^m^`fqv lc qeb *Super**L I >@) qeb kbt crk`qflkp lc qeb f j molsba @,I `^k _b b j milvba buqob j biv bccb`qfsbiv) ^ka molar`qflk lc pqbbi mi^qbp tfqe buqob j biv il t obpfa*r^i pqobpp fp mlppf_ib+

5. New Products Manufactured Using Innovative Processes

5.1 Steel Products for Shipbuilding

Tfqe qeb ob`bkq qobka ql t^oa i^odb*p`^ib `lkq^fkbo pefmp) eb^sv d^rdb) efde pqobkdqe pqbbi mi^qbp ^ob fk`ob^pfkdiv ^almqba) obnrfofkd riqo^*i^odb eb^q fkmrq fk tbiafkd+ ?b`^rpb qefp `^rpbp `l^opbkfkd lc qeb E>W j f`olpqor`qrob) pb`rofkd il t qb j mbo^qrob qlrdekbpp e^p _b`l j b ^ mol_ib j+ Ql j bbq qefp kbba) GCB Pqbbi mol*ar`bp eb^sv d^rdb) efde pqobkdqe pqbbi mi^qbp tfqe kl obar`qflk fk tbia^_fifqv ^q qeb p^j b `^o_lk bnrfs^ibkq %C_{bn}& ^p `lksbkqflk^i pqbbip _v rpfkd qeb *Super*\*L I >@) tef`e cb^qrobp ^ efde `llifkd o^qb ^ka `llifkd rkfclo* j fqv+

5.2 Steel Products for Architectural Construction

Efde pqobkdqe mi^qbp ^ob obnrfoba ^p pqbbi co^j b j ^qb*of^ip clo efde*ofpb `lkpqor`qflk fk ro_^k ^ob^p+ Lk qeb lqebo e^ka) fk sfbt lc qeb co^`qrob a^j ^db ql _b^j badb tbiap fk qeb Evldlhbk*K^k_r B^oqenr^hb %Hl_b B^oqe*nr^hb) .662& qebob fp ^ ebfdeqbkba kbba clo efde mboclo* j ^k`b pqbbi molar`qp tfqe ^ il t vfbia o^qfl %vfbia mlfkq, qbkpfib pqobkdqe&) efde qlrdekbpp) ^ka dlla tbia^_fifqv fk ^o`efqb`qro^i pqbbi co^j bp+ Ob`bkqiv) qebob e^p ^ipl _bbk ^ ebfdeqbkba kbba clo pqbbi molar`qp tfqe f j molsba qlrdekbpp fk qeb E>W fk qeb i^odb eb^q fkmrq tbiafkd rpba fk _lu `lir j kp+ Fk obpmlkpb ql qebpb kbbap) GCB Pqbbi absbilmba ^ pqbbi mi^qb tfqe ^ il tbo vfbia mlfkq s^irb lc 052 K, j j á) ¦E ? I052 %Efde*?rfiafkd 052&)´ ^p ^ efde pqobkdqe pqbbi molar`q tef`e lccbop ^ `l j _fk^qflk lc b`lkl j v) pbfp j f` obpfpq^k`b) ^ka tbia^_fifqv) j ^hfkd crii rpb lc ^as^k`ba Q J @M qb`eklildv tfqe qeb *Super**L I >@) ^ka ob`bfsba j ^qbof^i ^rqelofw^qflk col j G^m^k$p J fkfpqbo lc I^ka) Fkco^pqor`qrob ^ka Qo^kpmloq+ Fk ^aaf*qflk) GCB Pqbbi e^p ^ipl absbilmba ^ka `l j j bo`f^ifwba efde E>W qlrdekbpp pqbbip lc qbkpfib pqobkdqe col j 16- K, j j á ql 26- K, j j á do^ab pqbbip clo i^odb eb^q fkmrq tbiafkd+

5.3 Steel Products for Bridges

?b`^rpb _ofadbp ^ob f j mloq^kq pqor`qrobp fk qeb pl`f^i fkco^pqor`qrob) efde nr^ifqv ^ka ^as^k`ba c^_of`^qflk qb`ekfnrbp ^ob obnrfoba+ Tfqe i^odbo p`^ib pqor`qrobp ^ka ebfdeqbkba obnrfob j bkqp clo efde bc$^a$`fbk`v fk c^_of`^*qflk fk ob`bkq vb^op) efde mboclo j^k`b) efde pqobkdqe pqbbi mi^qbp tef`e lccbo efde pqobkdqe ^ka efde qlrdekbpp fk `l j _fk^qflk tfqe tbia^_fifqv ^ka b`lkl j v e^sb _bbk pqolkdiv ab j^kaba+ Clo qefp kbba) GCB Pqbbi absbilmba ^ka `l j j bo`f^ifwba ^k ^p*oliiba P J 24-Q J @ pqbbi mi^qb tfqe ^k lmqf j fwba _^i^k`b lc pqobkdqe ^ka qlrdekbpp _v j^hfkd j^uf j r j rpb lc qeb crk`qflkp lc qeb *Super*\*L I >@ ^ka `lkqoliifkd e^oabk^_fifqv _v j f`ol*^aafqflk lc ^iilv bib j bkqp+ Qefp qb`eklildv t^p ^ipl fkqolar`ba fk ^k buqob j biv*il t `^o_lk _^kfqf`*qvmb efde pqobkdqe pqbbi tfqe ^ `^o_lk `lkqbkq lc ibpp qe^k -+-/ j ^pp") ob^ifwfkd molar`qflk lc molar`qp `loobpmlkafkd ql qeb kbtiv*molmlpba pq^ka^oap ?EP2--%T& ^ka 4-- T^{4k}) ^f j fkd ^q o^qflk^ifw^qflk lc abpfdk,c^_of`^qflk ^ka efdebo mboclo j^k`b fk _ofadbp+ Tbiafkd e^oabkfkd fp ao^j ^qf`^iiv obar`ba) tefib ^ipl ^`efbsfkd efde pqobkdqe) ^ka _b`^rpb qeb pqbbi fp ^k ^p*oliiba molar`q) fq fp mlp*pf_ib ql j bbq peloq ab^aifkbp+

5.4 .