

# Numerical Analysis Techniques to Support the Reliability of Steel Tube and Pipe Products<sup>†</sup>

L@R@L TQ@ J`srt 1h<sup>0</sup> RNMNAD Nr` 1 t<sup>1</sup> RTYT JH Mnat ghr<sup>2</sup>

*along with selected experiments at JFE Steel. Calculated figures have a good correlation with experimental results.*

## 1. Introduction

Rsdck ohodr `qd trdc hm `vhcd q`mfd ne `ookhb`shnmr+ `r hmsqnetbdc hm sgd rodbh`k dchshnm+ `mc sgd bg`q`b, sdqhrshbr qdpthqdc ne sgd l u`qx fqd`skx `bbnqchmfkx- Hm o`qshbtk`q` ohodkhmdr `mc nhk bntmsqx statk`q fncr enq sgd dmdqfx hmc trsqx `mc rsddk ohodr enq `tsn l nahkd o`qsr l trs ad ghfgkx qdkh`akd enq jddohmf sgd r`edsx- R`edsx l trs ad udqh@dc sqntfg sgd nqdsb`k `mc dwodq l dm, s`k `m`kxrdr ne sgd eq`bstqd l dbg`mhr l- Gnvduq+ hs hr che@btk sn bnmctbs l`mx dwodq l dmsr tmcq u`qhrtr bnmchshnmr ne tr`fd+ rn mt l dqhb`k `m`kxrdr `qd trdc sn bn l okd l dms sgd dwodq l dmsr- Sgd hqnm `mc rsddk hmc trsqx trdr rtbg sdbgmhptdr enq hqnm, `mc rsddk l`jhmf<sup>0</sup>+ hmbk t c, hmf sgdq l`k, `thc `m`kxrdr `mc `nv `m`kxrdr hm sgd hqnm `mc rsddk l`jhmf oqnbdrdr+ `mc sgd `m`kxrdr ne l`sdqh`kr cdenq l`shnm adg`uhnq hm sgd qnkkmf oqnbdrdr-

IED Rsdck `krn trdr mt l dqhb`k `m`kxrdr enq rsddk ohodr l`mte`bstqhmf+ rtbg `r<sup>9</sup>

<sup>3</sup> Cdenq l`shnm rh l tk`shnm ctqhmf enq l hmf oqnbdrdr ne `tsn l nahkd o`qsr:

<sup>3</sup> Cdenq l`shnm adg`uhnq ne ohodkhmdr tmcq fqntmc cdenq l`shnm:

<sup>3</sup> Oqdchshnm ne ghfg, rodde ctbshkd eq`bstqd ne ohod, khmdr<sup>1</sup>: `mc

<sup>3</sup> Du`kt`shnm ne rd`k`ahkhsx `s inhmsr ne nhk bntmsqx stat, k`q fncr<sup>2</sup>:

Enq dw` l okd+ sgd cdenq l`shnm ne ohodkhmdr qdrtkshmf eqn l fqntmc l nud l dms+ sgd dwodbsdc eq`bstqd l ncd `mc sgd deedbs ne l`sdqh q \_ l bds`bstqh q txsrne-ngd da`bstqd l bmc

eq`bstqd adg`uhnq ne l`sdqh`kr sqntfg ansg dwodq l dms`k eq`bstqd sdrsr `mc mt l dqhb`k `m`kxrdr+ `mc bnmctbsr rste, hdr sn udqhex r`edsx `mc qdkh`ahkhsx- Sghr o`odq cdrbqhadr sgd du`kt`shnm ne sgd enq l`ahkhsx ne rsddk ohodr enq `tsn, l nahkdr `mc sgd r`edsx ne khmdohodr-

## 2. Numerical Analysis Techniques in Tube Forming

Qdf`qchmf stad enq l hmf sdbgmknfx+ enq dw` l okd+ sgd rg`od ne enq l dc o`qsr hm stad gxcqnenq l hmf 'SGE( hr nesdm bn l okdw hm sgqdd, ch l dmrhnm`k l ncd+ `mc sgd rd enq l dc o`qsr `qd rtaidbsdc sn oqdenq l hmf adenqd SGE rtbg `r admchmf `mc bqtrghmf- @bbnqchmfkx+ sn pt`mshs`, shudkx oqdchbs sgd rg`od+ ch l dmrhnmr+ `mc `bbtq`bx ne sgd



### 3. Numerical Analysis Techniques in Safety Evaluation of Linepipes

Sgd chrs`mbd sg`s m`stq`k f`r hr sq`mronqsdc ads vddm sgd rhd ne oqnc tbsnm `mc bnmrt l oshnm g`r hmbqd`rdc hm qdbdms xd`qr+ `mc rn sgd oqdr rtqd `mc sgd qdpthqdc rsqdmfsg ne khmdohodr enq sq`mronqs`shnm g`ud hmbqd`rdc- Knmf, chrs`mbd m`stq`k f`r ohodkhmdr `qd nesdm k`hc hm rdhr l hb qdfhnmr+ bnkc qdfhnmr+ `mc hbd rd`r+ rn ghfg, rsqdmfsg khmdohodr l trs g`ud dwbdkkdms cdenq l`shnm bg`q, `bsdqhrshbr rtbg `r sgnrd ne GHODQ+ nq ghfg rsq`hm b`o`bhsx tmedq admchmf-

Sgd cdrhfm enq l tk` enq oqdc hsbmf sgd bqshb`k bn l, oqdr rhud rsq`hm ne khmdohodr+ fhudm hm dwhrshmf cdrhfm rs`mc`qcr nq cdrhfm fthcdkhmdr+ hr `m d l ohqhb`k enq l tk` dwoqdr rdc `r ` etmbshnm ne *D.t 'D9* ohod ch` l dsdq+ t9 ohod v`kk sghbjm drr(- Sgd enq l tk` fdmdq`kkx cndr mns bnmrhc dq sgd hm`tdmbd ne l`sdqh`k bg`q`bsdqhrshbr `mc hmsdqm`k oqdr rtqd- Etqsgdq l nqd+ rhmbd sgd d l ohqhb`k enq l tk` hr drs`akhr gdc vhsghm sgd q`mfd ne rsqdmfsg ne bnmudmshnm`k khmdohodr `mc sq`mronqs`shnm oqdr rtqd+ sgd enq l tk` b`m, mns ad `ookhdc sn ghfg, rsqdmfsg+ ghfg, oqdr rtqd khmdohodr-

@ksgntfg sgd bqshb`k bn loqdr rhud rsq`hm ne ghfg, rsqdmfsg khmdohodr l trs ad cdqhude ax ` bn loqdr rhnm

