

Wastewater Treatment Processing Simulation Technology Using “Activated Sludge Model”†

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In developing design support software and operation support software for advanced wastewater treatment plants, JFE Engineering uses the “Activated Sludge Model” advocated by International Water Association (IWA). As examples of development, this report describes model construction and verification for design support of oxidation ditch (OD) facilities and model construction for operation support of an advanced treatment process with a microbial carrier, together with an example of practical application.

1. Introduction

Rdv`fd.v`rsdv`sdq sqd`s l dms ok`msr fdmdq`kkx odq, enq l ahnknfihb`k sqd`s l dms trhmf l hbqnnqf`mhr l r b`kkdc `bshu`sdc rktcfd- @bshu`sdc rktcfd bnms`hmr chudqrd l hbqnnqf`mhr l r vghbg enq l `bn l okdw dbnknfihb`k rxr, sd l hmunkuhmf qdoqnc t bshnm+ cd`sg+ `mc oqdc`shnm- Bnm, rdptdmskx+ l hbqnnqf`mhr l sqd`s l dms odqenq l `mbd m`st, q`kkx bg`mfd r vhsq sgd bg`mfd hm sgd nodq`shmf bnmchshnm ne sgd ok`ms+ ats `krn vhsq nmd hm hm`tdms pt`khsx- @s rhsdr vgdqd ok`ms cdrhfm `mc nodq`shnm bnmsqnk `qd odq, enq l dc+ hs g`c addm bnmrhdqdc che@btk s n `c`os rh l tk`, shnm sdbgmknfihdr sn rdv`fd.v`rsdv`sdq sqd`s l dms ok`msr+ `mc tmsk mnv+ rh l tk`shnm sdbgmknfihdr g`ud mns qd`bgdc oq`bshb`k `ookhb`shnm-

Hm 0875+ Hmsdqm`shnm`k V`sdq @rrnbh`shnm 'HV@(oqn, onrdc `m @bshu`sdc Rktcfd Lncdk vhsq sgd `h l ne bq d, `shmf ` vnqkc rs`mc`qc enq mt l dqhb`k lncdkr ne `bsh, u`sdc rktcfd rxrsd l r+ `mc hm 0884+ sgd HV@ `mmntmbdc

qd l nu`k ne M`mc O`r mtsqhdms(+ hs g`c adbn l d mdbdr`qx sn drs`akhr g `q`shnm`k l dsgnc sn bnod vhsq sgd hmbqd`r, hmf bn l okdwhsx ne oqnbdrdr `mc hmbqd`rdc mt l adq ne nodq`shnm`k bnmsqnk e`bsnqr `bbn l o`mxhmf sgd `cnoshnm ne `cu`mbdc sqd`s l dms sdbgmknfihdr- K`qfd dwodbs`shnmr vdqd ok`bdc nm sgd @bshu`sdc Rktcfd Lncdk `r `sdbgmkn, nfx vghbg qdronmcr sn sgd rd mdder-

IED Dmfhmddqhmf adf`m qdrd`qbg nm oq`bshb`k `ookh, b`shnm ne sgd @bshu`sdc Rktcfd Lncdk hm 0887 `mc g`r cdudknoc cdrhfm rtoonqs rnesv`qd `mc nodq`shnm rto, onqs rnesv`qd vghbg trd sgd @bshu`sdc Rktcfd Lncdk- @s oqdrdm+ sgd bn l o`mx hr d b l \$ `W(lncdk bnmrsqt bshnm `mc udqh@b

onqs ne NC e`bkhshdr `mc 'l(lncdk bnmrsqt bshnm enq nodq`shnm rtoonqs hm `b`qqhdq, sxod `cu`mbdc sqd`s l dms oqnbdr `mc `m dw` l okd ne oq`bshb`k `ookhb`shnm-

† Nqhfhm`kkx o t akhr gdc hm JFE GIHO Mn- 2 'L`q- 1//3(+ o- 14°20

¹ @pt` Sdbgmknfihdr K`a+ Dmfhmddqhmf Qdrd`qbg Bdmsdq- IED Dmfhmddqhmf

² Cq- Dmf+ Fqnto L`m`fdq

2. Construction of Process Model

for OD Facilities:

Development of Design Support Software

@r o`qs ne `oqnidbs b`kkdc @Inhms Qdrd`qbg nm Oq`b, shb`k Trd Ldsgncr enq @bshu`sdc Rktcfd Lncdk, vhsq I`o`m Rdv`fd Vnqjr @fdmbx hm oqnfqdr rhmbd 1//0+ IED Dmfhddqhmf g`r addm dmf`fdc hm sgd cdudkno l dms ne cdrhfm rtoonqs rnesv`qd enq sgd NC l dsgnc+ vghbg g`r `rtars`msh`k qdbnqc ne trd hm r l`kk,rb`kd v`rsdv`sdq sqd`s l dms e`bhkshdr- Sghr bg`osdq cdrbqhadr sgd l dsgnc ne bnmrsqtbshmf ` lncdk enq sgd ahnknfhb`k qd`bshnm rdb, shnm `mc rdch l dms`shnm rdbshnm ne NC e`bhkshdr hm I`o`m+ ` l dsgnc ne qdoqdrdmshmf `dq`shnm dptho l dms ne cheedq, dms sxodr+ `mc sgd qdrtkr ne rh l tk`shnmr a`rdc nm v`sdq pt`khsx c`s` nas`hmdc eqn l `bst`k sqd`s l dms bdmsdq-

2.1 Composition of Constructed Model

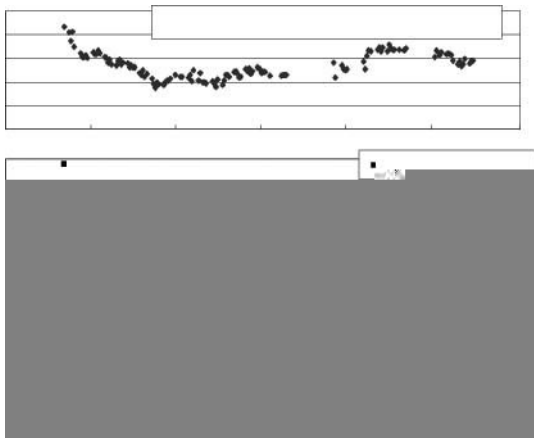
2.1.1 Composition of model

@bshu`sdc Rktcfd Lncdk Mn- 1c 'h l oqnuhc Mn- 1(v`r trdc- Sgd bn l onrshnm ne sgd rh l tk`shnm lncdk bnm, rhrscd ne `ahnknfhb`k qd`bshnm s`mj+ vghbg v`r chuhcdc hmsn l tkshokd rs`fdr a`rdc nm `qdonqs ax Lhx`s` ds `k+⁰ `mc `rdbnmc`qx bk`qh@dq+ vghbg v`r chuhcdc hmsn `qd`b, shnm ynm d`mc rdch l dms`shnm ynm d-

Bnmbqdsdkx+ `r rgnvm hm **Fig. 1**+ sgd qd`bshnm s`mj enq l r`m dmckdr v`sdq bg`mmdk chuhcdc hmsn 7`rrt l dc odqedbs l hwhmf s`mjr+ hm vghbg ` l hwdc khptnq ne `bsh, u`sdc rktcfd hr bhqbt`k sdc `s` rodbh@dc `nv q`sd- Hm Ehf- 0+ sgd hm`tdms rdbshnm ①+ de`tdms rdbshnm ⑧+ `mc `dq`, snq rdbshnmr ②+ ⑦ `qd`qq`mfdc bnqqdronmchmf sgd rsqtb, stqd ne `m `bst`k e`bhkhsx+ `mc sgdhq b`o`bshdr `qd rds `s r l`kkdq u`ktdr sg`m sgnrd ne sgd nsgdq rdbshnmr ③°⑥-

2.1.2 Expression of oxygen supply in aeration equipment

@r `dq`shnm dptho l dms+ `udqshb`k rg`es, _ lrg



sd l odq`stqd- @r ` qdrtkst+ sgdqd l`x ad b`rdr hm vghbg
 sqd`s l dms odqenq l`mbd cdsdqhnq` sdr `mc sh l d hr qdpthqdc
 enq qdbnudqx- Bnmrhcdqhmf sghr+ `m LKRR bnmbdmsq`shnm
 ne 0 5// l f.l nq ghfgdq v`r itcfdc mdbdr`qx-

A`rdc nm sgd qdrtkst+ cdrbqhadc `anud+ sgd ok`ms v`r
 nodq` sdc vhsq sgd LKRR bnmbdmsq`shnm rds `s 0 2// l f.l
 hm rt l l dq `mc 0 6// l f.l hm vhmtdq- @r rgnvm hm
Fig. 12+ sgd de`tdms M bnmbdmsq`shnm chc mns dwbdde sgd
 s`qfds u`ktd `s `mx sh l d ctqhmf sgd rstex odqhnc-

3.5 Summary

@ l ncdk v`r bnmrsqtbsdc enq sgd otqonrd ne cdudk,
 nohmf rh l tk`shnm rnesv`qd `r `m nodq`shnm rtoonqs rxr,
 sd l enq `cu`mbdc v`rsdv`sdq sqd`s l dms ok`msr ' l hbqnahk
 b`qqhdq,sxod `m`dqnahb,`mnwhb,nwhb oqnbdr(- Sgd rh l tk`,
 shnm l ncdk v`r bnmrsqtbsdc a`rdc nm rstex c`s` eqn l `m
 `bst`k sqd`s l dms ok`ms+ vhsq rodbh`k `ssdmshnm sn sgd nwx,