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Life enJourn2014;11(1) hlicien <http://www.lcesitcom.lifescien.com> 292 The Analytical Approach to Improve Production Line Muhammad sudi 1, Hanafeek 2 1, Department Industrial Engineering ( ), g sity, 21911, Saudi Arabia 2 Suez al iverlnial Collducat, Egypt muhsudi@hail.com ; hanyahcom Abstract: Thmang y to continin to crefficienin oduct developmenso to competitansustainable.

situationis cinthmaning y optithutilizaof g ufacturg to thdevelopmenof pras comti existiand ew oducts. inscapaof ocesg prnmally has complstre to s pron es, automotipharcald oleum in e oducticapacity thtype maninsystem as be mizin der optie uti multi-stage oduct es. is wiluse analcalapprwhich validated Ar simulation, devela forpron e . on e dings, is ththancal apprplay important r thoptimizationof multi-pr multi-stage oducties.

[MuhmarHanSh The calApproach Improve zatiof on . Life SciJ 292-300] [hp://lifescien.com](http://lifescien.com) . Ke Ara simulation; analapprcase mioducts; oducti lin 1. ucti Thefforto ove forces mang have ever ded. ese imovemenenfforcould in of ti rce izationWIP, oughof e oralso er force s. Some prstudies imprcycle me conby rs Baker Baker anPyke Dobs et Pottan Baker(1989),Steinand Gr (2002), son anVillarranAlan (2011).Burgess etal .

Hopp d man (2004),Ch et (2006), i (2008),Mar et anSeraj prth es imprthre utimaning system. Maninsystem as y iation intern n stage n pr prThcombinaof ese atis l rmantof ufacturg exist. Thtarsinge oduct, gle- stage -prmultisinoduct,an multistage oduct. d lly multistage ufacturinsystem,it catizfurerintwo y pwh e bu withbufferThe e y red single-stage ufacturinsyst(Baker 1987; 1989; et .,

Najdawi,1992, ElanKleinfer 1993; im d ta, anmultistage mang em , Szenovit 1983; ,

wawadi et al. , The e y eterof mang em eeded be ed. ose pars amed force e mang some thar uti oughand erartwo methcommly to uatpermanof mang wharanalcalmeth ansim meth Wal(2006) addre capay estimon d ovemenin multi-pr unrble oductilinwithfinbuffer Th pre owed e umeronof e ed statthata onmay ave ile ocessinth miof oducts. atis svice terronor downwerta accounas e to epair e led.

apprcompla linpramminmodel alg e oducti sequenand serg prat opriate positis thsequenThmodified prthexpected tiof e elia prone. Gamber(2008) esenthevalonof thimplementation a ufacturlinby compag enlaHis was sed onancalmodel multoduct pron e out . parth prapprinbotha eliminar chconinthoducti utilization ratd than analuatine tota cost unitthselectiof e set-up poliby alyzig strwh e thsequential on each e, e Life enJourn2014;11(1) hlicien <http://www.lcesitcom> lifesciencom 293 parelinof ionthparelinof ches, ane executiin a pred im Su d dra developed efficienanalcalappr od modeliananalng -mache oductilin Throbtaed g e od compaed withthobtaed om existinmethTh simulation imenweralr vale e ancapprommethIt sh thanalcalappr od ks y efficieny d sfactoranthrobtaed usine methch acceptaor Koo etal. pra ufacturin smodelig oachusincomputer spreer war a c planninmodel d astiqueuing ar inated.

stochpermanmeasur suchas oughtime worin ocess wellas deteristimeasurcan capturdiry om thprmodel.Sever manufacturin feates as inbranbat proncanbe cluded e e permanof e oposed was uatby compag s esults thobtaed om er existinappres. eir dinforth compa ed at e ximallowed elat errwas FranSatan(1996) eporthat e pertage enbetweenthaverage flow tiderived om ancalmmodel d om simulation was elay l than 12%) ost tested. indicated thgenress thanalcalmodel.Th study ovided rer ve y measurin Flexible ufacturSystems force quickly oducinan ble esult en compaed to the result.

Rezaand oti(1999) esented thdesign compont y es Prin CirBoar(PCB) ufacturinenonments a leng oblem by y s th electricis dustr l th paper thdiscussed e operiontrassociawith ese aland esena ematical pramminfrk capturrtdesignissues. of e canbe wed a l of e ed mathprg ey oped effectialithms solve ese ematical prams. Mard Noored e use pron of tiin su Compon(M) Bhbased thy.

Thaim thstudy to ieve appr queuinancalmmodel d minit permanmeasurby alyzig e rements d g ufacturg tiResults eirstudy ly owed t queuinthy veruseful d in evalinthcaparement thpron sfacilies. Papadopoulos used e oldintime model od yzianevalg e permanmeasurof oducti es. appranalc mula derived caltinthaverage oughof y tion pronlinwithnintermediate s ween adjacenionenvice mes.

Tan pra od determin thmean thvarice thamount maial prin fixed inter a tin materials pronsystem h statis seranM ionin lel d o ter bus. e c esult ived this detered e otidistronof

the amount of products processed a time value. In this asymptotic but, the force measurement through the profit of a customer can be determined. This can be used in the analysis of the manufacturing process (Haj et al., 2011) based on the analytical approach with expert opinion on simulation, of an analysis of the process flow diagram. The results of the simulation approach offer a preliminary conclusion of the process flow diagram. The results of the simulation approach offer a preliminary conclusion of the process flow diagram. The results of the simulation approach offer a preliminary conclusion of the process flow diagram.

The model and tools of the permanent value of production systems severely reduce the stress and the statistical data. The simulation results show that the process flow diagram is not only a function, but also considers both cost and the average cost of the assignment of the coefficient of the buffer. In the simulation, the process flow diagram is not only a function, but also considers both cost and the average cost of the assignment of the coefficient of the buffer. In the simulation, the process flow diagram is not only a function, but also considers both cost and the average cost of the assignment of the coefficient of the buffer. In the simulation, the process flow diagram is not only a function, but also considers both cost and the average cost of the assignment of the coefficient of the buffer.

We will discuss the results of the simulation. We discuss the identification of the process flow diagram with the simulation results. As above, the results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram.

Pillar A, Bracket of the product and the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram.

Process flow diagram for the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram. The results are shown in two stages of the process flow diagram.

The approach is an analytical approach that is used in this study to estimate the amount of the process flow diagram.

oduct pron lins can be sketched 4. Figure 4. -prmulti-stage oductilin witbufferbet kstatis Morth e of oduct terat woron (WS 1 ) d frthlast woron f ) indicated tharrin Figur4.In thcase,thypof oducts terinto thpronlinis thforof bat ch woron  $j = 2, f$  ) differt e othworonfor its time d prg rto oduct i i 1, 2, , c Thcapabilof kstation pr'good' oduct thyield tha woron.In eral, e can definas thperge prwhis or acceptaftrthperof oduct componts e ocessed ough woron Thcumulaof in kstation j th n multiplionthall thr rineachwor at ecedes woron j . oth inpronlinis thrUsered ocessinspeed a mainexpras ina period (usually ourunder ormal ing dits).

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(3) whe, total ocess me pr i woron j, mean prtiof pr i at kstati j, is mean setup of oduct i at kstat is ed t of iation of e prt i SCV thjob tian SCV th totaprti Thpermanmeasurof eris (thutiof e esourat kstation j ), ane equati is as whe, iset prthvisit kstats j, ithnof esourin kstation j, an is af aesourt woron j. Life enJourn2014;11(1) hlicien <http://www.lcesitcom> lifesciencom 296 whe, is timbetweenfaie rce a kstat j, an meantime r a rce kstation j.

If y fferexists e kstation to oth kstati feld Li derthfolg oximate for thr ... ( whe, M number woronin oducti linand B is buffersize (n Based e on(2) d we derthnequatifor eleese e pr ( ) ownin e equation ... ( Thancalmodel above albased one folg assumptithsystem: ? Thsizes of s arequal. ? Thbufferdoes ot l,anjobs thr witerane. ? Thfirstation n ved d e ext statione n ? Operg betfaies a ion j arexponentially dbuted (with mean ). ? Repaitimat station j e en distrh mean ). 4.

ExperiProce onthdiscussionon e alyti apprabove, e enpre th study be ed out Figur5. Figur Experocedurart this we st yzed e g mang ocess thcompanto th currt and imaning tit Pron e And en imprutization parwe parameter puts  $B_i$  d  $B$  . It possible chothparameter puts as  $s_i, n_j$  , so ) thoth puts e e red imove buthnof e pronrces ches d oducti equipmts).

Clearthalgorithm pre imove lizati onthpaperis tr anerr ocesunthoptimutilizatcanbe achieved. e ocess own e Figur6.ocedurto impruti 5.Applicati stl e secti ela to e dinfounfrthexisting ocess,an th e rto e gs  $B_i$  par modified. Thinparams miobject prfor ch e buffersize e own Ta3. er put eterwharsetup anprsimat kstatiis ownin Ta2, d e cumulative prdata whgathed fre y 67%.

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