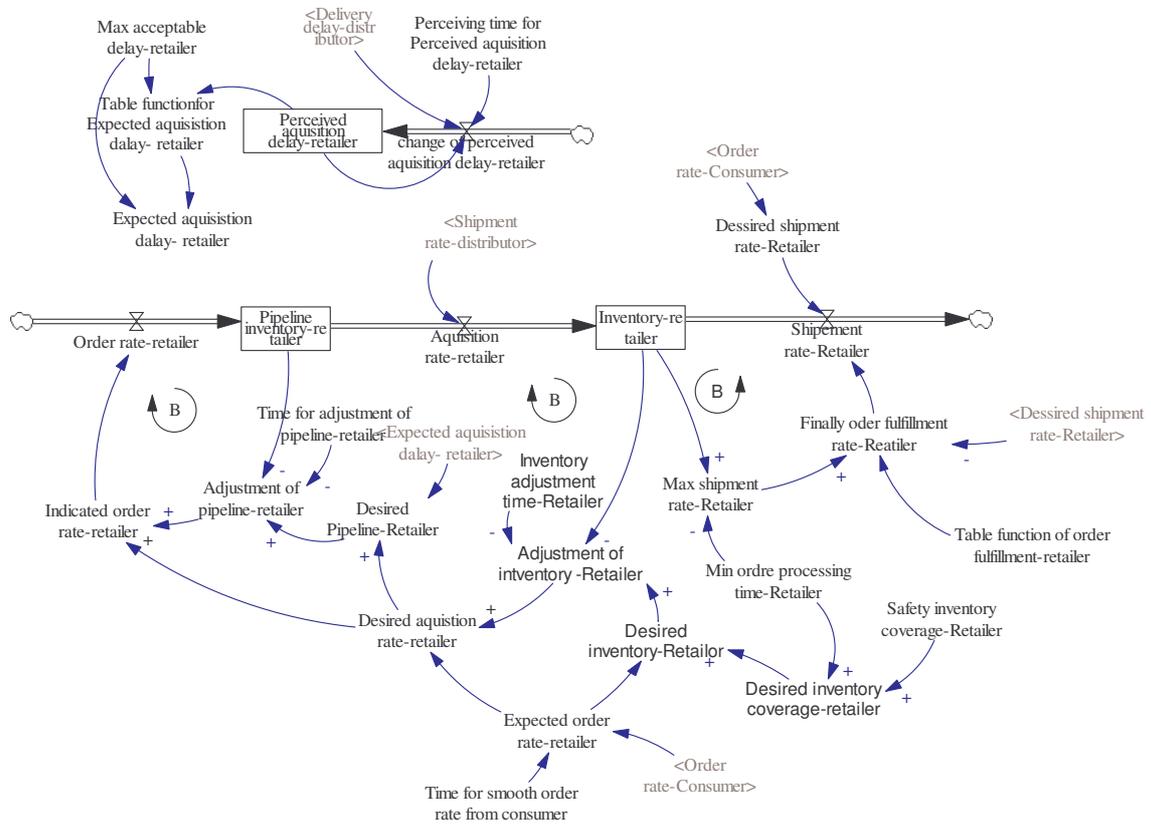
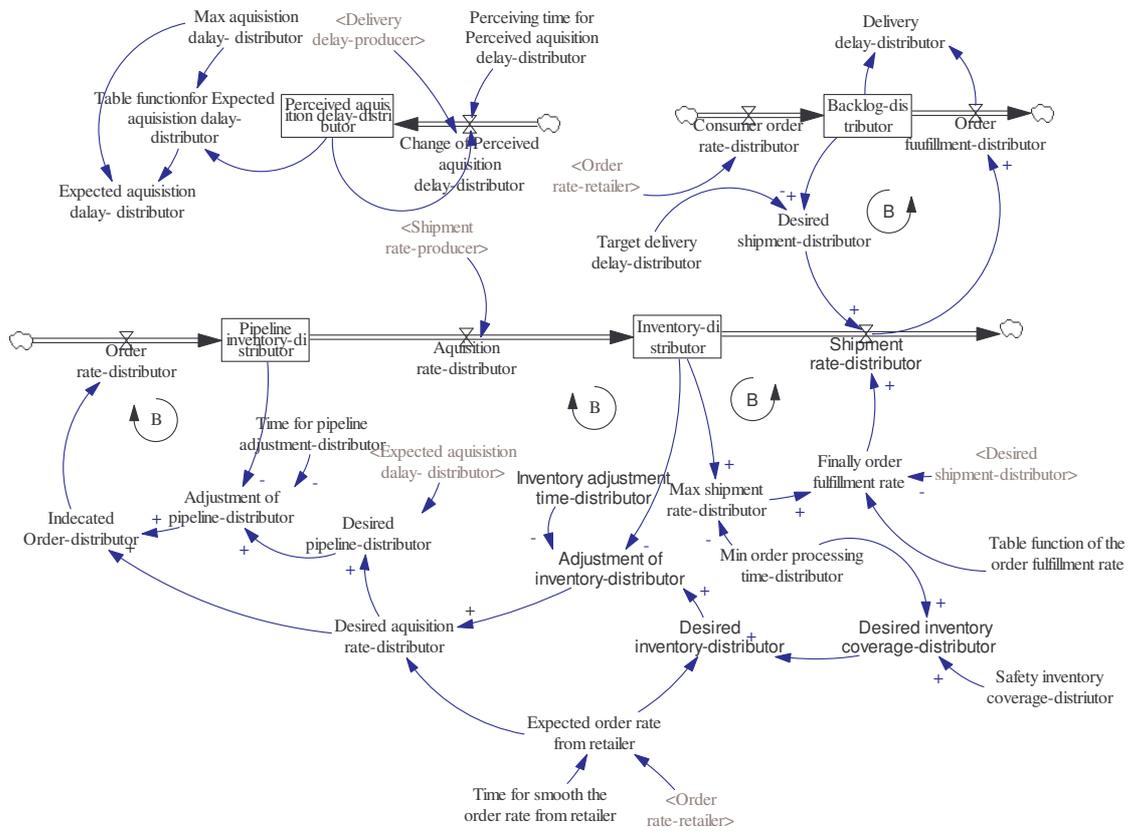
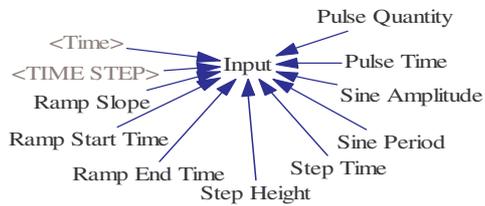
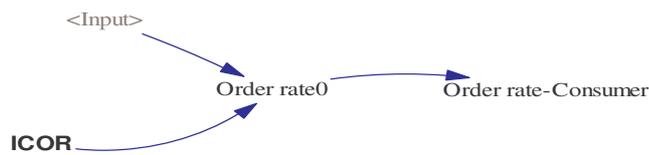
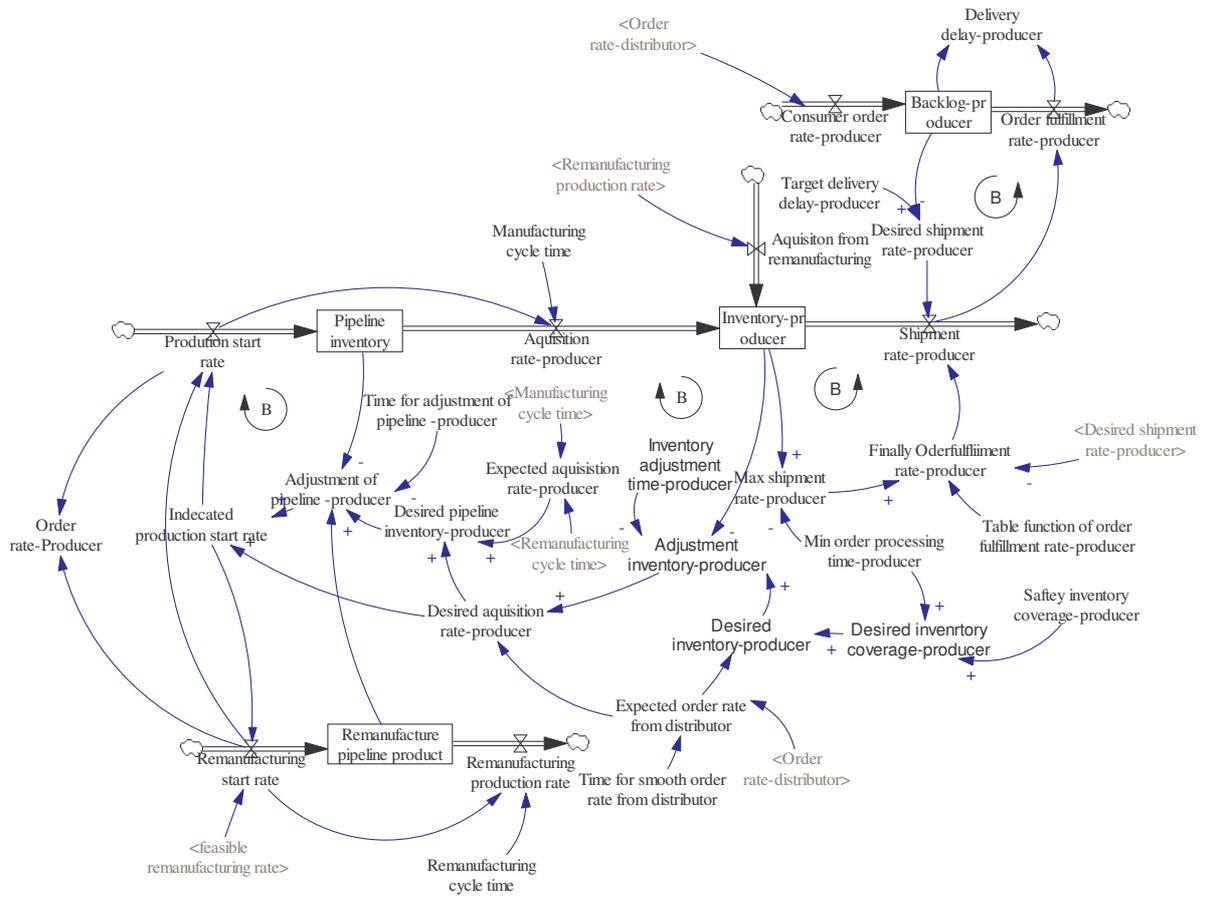
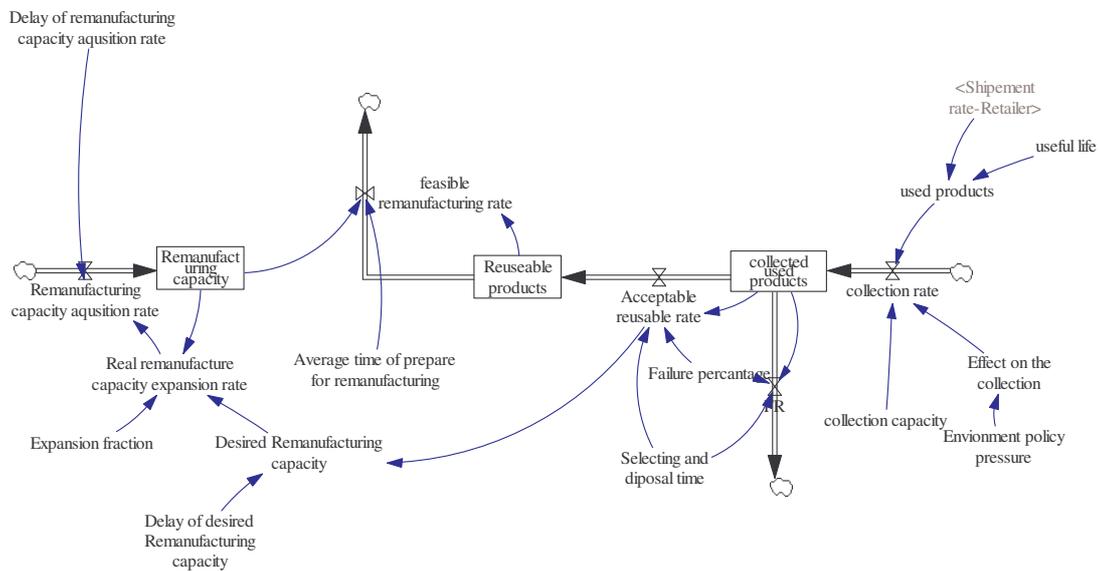


Model structure and equations of the closed loop supply chain.









Equations:

Acceptable reusable rate=

$$\text{collected used products} * (1 - \text{Failure percentage}) / \text{Selecting and diposal time}$$

~ unit/Week

~ accepted for reuse

|

$$\text{"Adjustment inventory-producer"} = (\text{"Desired inventory-producer"} - \text{"Inventory-producer"}) /$$

"Inventory adjustment time-producer"

~ unit/Week

~ The desired production rate is adjusted above or below the forecast based on the \ inventory position

of the plant. When desired inventory > inventory, desired production is \ increased (and

vice-versa). Inventory gaps are corrected over the inv. adj. \ time.

|

$$\text{"Adjustment of inventory -Retailer"} = (\text{"Desired inventory-Retailer"} - \text{"Inventory-retailer"}) /$$

"Inventory adjustment time-Retailer"

~ unit/Week

~ The desired production rate is adjusted above or below the forecast based on the \ inventory position

of the plant. When desired inventory > inventory, desired production is \ increased (and

vice-versa). Inventory gaps are corrected over the inv. adj. \ time.

|

"Adjustment of inventory-distributor" = ("Desired inventory-distributor" - "Inventory-distributor" \ )/

"Inventory adjustment time-distributor"

~ unit/Week

~ The desired production rate is adjusted above or below the forecast based on the \ inventory position of the plant. When desired inventory > inventory, desired production is \ increased (and vice-versa). Inventory gaps are corrected over the inv. adj. \ time.

|

"Adjustment of pipeline -producer"=

("Desired pipeline inventory-producer" - Pipeline inventory-Remanufacture pipeline product \

)/"Time for adjustment of pipeline -producer"

~ unit/Week

~ The order rate is adjusted to close any gap between the desired and actual \ supply line.

|

"Adjustment of pipeline-distributor"=

("Desired pipeline-distributor" - "Pipeline inventory-distributor")/"Time for pipeline adjustment-distributor"

~ ö/ÖÜ

~ The order rate is adjusted to close any gap between the desired and actual \ supply line.

|

"Adjustment of pipeline-retailer"=

("Desired Pipeline-Retailer" - "Pipeline inventory-retailer")/"Time for adjustment of pipeline-retailer"

~ unit/Week

~ The order rate is adjusted to close any gap between the desired and actual \ supply line.

|

"Aquisition rate-distributor"=

"Shipment rate-producer"

~ unit/Week

~ The acquisition rate is determined by the quantity on order and the average \ acquisition delay.

In this simple model, the acquisition delay is first-order, but in general can be any high-order process.

|

"Aquisition rate-producer"=

DELAY FIXED(Production start rate, Manufacturing cycle time, Production start rate )

~ unit/Week

~ The product acquisition rate is determined by the quantity on pipelin and \ the average acquisition delay.

|

"Aquisition rate-retailer"=

"Shipment rate-distributor"

~ unit/Week

~ The acquisition rate is determined by the quantity on order and the average \ acquisition delay.

In this simple model, the acquisition delay is first-order, but in general can be any high-order process.

|

Aquisiton from remanufacturing=

Remanufacturing production rate

~ unit/Week

~ Aquisiton from remanufacturing

|

Average time of prepare for remanufacturing=

1

~ Week

~ Avage Remanufaturing prepire time

|

"Backlog-distributor"= INTEG (

+"Consumer order rate-distributor"- "Order fuufillment-distributor",

8)

~ unit

~ The firm's backlog of unfilled orders

|

"Backlog-producer"= INTEG (

+"Consumer order rate-producer"- "Order fulfillment rate-producer",

8)

~ unit

~ The firm's backlog of unfilled orders

|

"Change of Perceived aquisition delay-distributor"=

("Delivery delay-producer"- "Perceived aquisition delay-distributor")/"Perceiving time for Perceived aquisition delay-distributor"

~  
~ |

"change of perceived aquisition delay-retailer"=

("Delivery delay-distributor"- "Perceived aquisition delay-retailer")/"Perceiving time for Perceived aquisition delay-retailer"

~  
~ |

collected used products= INTEG (

INTEG(+collection rate-Acceptable reusable rate-FR),  
2)

~ unit  
~ collected product  
|

collection capacity=

1000  
~ unit/Week  
~ collection capacity  
|

collection rate=

MIN(collection capacity, Effect on the collection\*used products )  
~ unit/Week  
~ cellation rate  
|

"Consumer order rate-distributor"=

"Order rate-retailer"  
~ unit/Week  
~ The incoming order rate, equal to customer orders.  
|

"Consumer order rate-producer"=

"Order rate-distributor"  
~ unit/Week  
~ The incoming order rate, equal to customer orders.  
|

Delay of desired Remanufacturing capacity=

4  
~ Week  
~ |

Delay of remanufacturing capacity acquisition rate=

24  
~ Week  
~ |

"Delivery delay-distributor"=

"Backlog-distributor"/"Order fulfillment-distributor"  
~ Week  
~ |

"Delivery delay-producer"=

"Backlog-producer"/"Order fulfillment rate-producer"  
~ Week  
~ |

"Desired acquisition rate-distributor"=

MAX(0, Expected order rate from retailer+"Adjustment of inventory-distributor" )  
~ unit/Week  
~ The desired acquisition rate is expected losses.  
|

"Desired acquisition rate-producer"=

MAX(0, Expected order rate from distributor+"Adjustment inventory-producer" )  
~ unit/Week  
~ The desired acquisition rate is expected losses.  
|

"Desired acquisition rate-retailer"=

MAX(0, "Expected order rate-retailer"+"Adjustment of inventory -Retailer" )  
~ unit/Week  
~ The desired acquisition rate is expected losses.  
|

"Desired inventory coverage-producer"=

"Min order processing time-producer" + "Safety inventory coverage-producer"  
~ Week  
~ Desired inventory coverage is the number of weeks of the demand forecast the  
plant \  
seeks to maintain  
in inventory. This inventory coverage is required to maintain delivery \  
reliability by  
buffering the plant against unforeseen variations in demand or \  
production. It consists of the normal order processing time plus an \  
additional term representing the coverage desired to maintain safety \  
stocks.  
|

"Desired inventory coverage-distributor"=

"Min order processing time-distributor" + "Safety inventory coverage-distributor"

~ Week

~ Desired inventory coverage is the number of weeks of the demand forecast the plant \

seeks to maintain

in inventory. This inventory coverage is required to maintain delivery \ reliability by

buffering the plant against unforeseen variations in demand or \ production. It consists of the normal order processing time plus an \ additional term representing the coverage desired to maintain safety \ stocks.

|

"Desired inventory coverage-retailer"=

"Min order processing time-Retailer" + "Safety inventory coverage-Retailer"

~ Week

~ Desired inventory coverage is the number of weeks of the demand forecast the plant \

seeks to maintain

in inventory. This inventory coverage is required to maintain delivery \ reliability by

buffering the plant against unforeseen variations in demand or \ production. It consists of the normal order processing time plus an \ additional term representing the coverage desired to maintain safety \ stocks.

|

"Desired inventory-distributor"=

"Desired inventory coverage-distributor"\*Expected order rate from retailer

~  $\bar{I}_D$

~ The desired inventory level sought by the plant. Experience suggests that to \ maintain customer

service by providing full and reliable deliveries, the plant must maintain a \ certain

coverage of throughput (demand), estimated by the demand forecast.

|

"Desired inventory-producer"=

"Desired inventory coverage-producer"\*Expected order rate from distributor

~ unit

~ The desired inventory level sought by the plant. Experience suggests that to \ maintain customer

service by providing full and reliable deliveries, the plant must maintain a \ certain

coverage of throughput (demand), estimated by the demand forecast.

|

"Desired inventory-Retailer"=

"Desired inventory coverage-retailer"\*"Expected order rate-retailer"

~ unit

~ The desired inventory level sought by the plant. Experience suggests that to \ maintain customer

service by providing full and reliable deliveries, the plant must maintain a \ certain

coverage of throughput (demand), estimated by the demand forecast.

|

"Desired pipeline inventory-producer"=

"Expected aquisition rate-producer"\*"Desired aquisition rate-producer"

~ unit

~ The desired supply line maintains sufficient units on order to yield the desired acquisition rate.

|

"Desired pipeline-distributor"=

"Expected aquisition delay- distributor"\*"Desired aquisition rate-distributor"

~ unit

~ The desired supply line maintains sufficient units on order to yield the desired acquisition rate.

|

"Desired Pipeline-Retailer"=

"Expected aquisition delay- retailer"\*"Desired aquisition rate-retailer"

~ unit

~ The desired supply line maintains sufficient units on order to yield the desired acquisition rate.

|

Desired Remanufacturing capacity=

DELAY1I(Acceptable reusable rate, Delay of desired Remanufacturing capacity , 1 )

~ unit/Week

~ desired remanufacturing capacity

|

"Desired shipment rate-producer"=

"Backlog-producer"/"Target delivery delay-producer"

~ unit/Week

~ The desired shipment rate is determined by the backlog and the target \ delivery delay.

|

"Desired shipment-distributor"=

"Backlog-distributor"/"Target delivery delay-distributor"

~ unit/Week  
~ The desired shipment rate is determined by the backlog and the target \ delivery delay.  
|

"Dessired shipment rate-Retailer"=  
"Order rate-Consumer"  
~ unit/Week  
~ The desired shipment rate is determined by the backlog and the target \ delivery delay.  
|

Effect on the collection= WITH LOOKUP (  
Environment policy pressure,  
((0,0)-(1,1)],(0,0.21),(0.1,0.25),(0.2,0.28),(0.3,0.34),(0.4,0.47),(0.5,0.7),(0.6,\ 0.82),(0.7,0.92),(0.8,0.97),(0.9,0.99),(1,1) )  
~ Dimensionless  
~ table function  
|

Environment policy pressure=  
0.5  
~ Dimensionless  
~ colleccion percentage  
|

Expansion fraction=  
0.5  
~  
~ |

"Expected aquisition dalay- distributor"=  
"Table functionfor Expected aquisition dalay- distributor"\*"Max aquisition dalay- distributor"  
~ Week  
~ |

"Expected aquisition dalay- retailer"=  
"Table functionfor Expected aquisition dalay- retailer"\*"Max acceptable delay-retailer"  
~ Week  
~ |

"Expected aquisition rate-producer"=  
(Manufacturing cycle time+Remanufacturing cycle time)/2  
~ Week  
~ The expected delay between production start and acquisition of new units.

Assumed \

in this simple model to equal the actual acquisition lag, but is modeled more realistically as an information delay of the actual value.

|

Expected order rate from distributor=

SMOOTH("Order rate-distributor", Time for smooth order rate from distributor )  
 ~ unit/Week  
 ~ |

Expected order rate from retailer=

SMOOTH("Order rate-retailer", Time for smooth the order rate from retailer )  
 ~ unit/Week  
 ~ |

"Expected order rate-retailer"=

SMOOTH("Order rate-Consumer", Time for smooth order rate from consumer )  
 ~ unit/Week  
 ~ |

Failure percentage=

0.2  
 ~ Dimensionless  
 ~ failure percentage  
 |

feasible remanufacturing rate=

MIN(Remanufacturing capacity, Reuseable products/Average time of prepare for remanufacturing\  
 )  
 ~ unit/Week  
 ~ remanufacturing rate  
 |

"Finally oder fulfillment rate-Reatiler"=

"Table function of order fulfillment-retailer"("Max shipment rate-Retailer"/"Dessired shipment rate-Retailer"\  
 )  
 ~ Dimensionless  
 ~ The Fraction of customer orders filled is determined by the ratio of the \  
 normal shipment rate to the desired rate. The normal rate is the rate \  
 current inventory permits under normal circumstances. Low inventory \  
 availability reduces shipments below customer orders. Unfilled customer \  
 orders are lost.  
 |

"Finally Oderfulfiiment rate-producer"=

"Table function of order fulfillment rate-producer"("Max shipment rate-producer"/"Desired shipment rate-producer"\

- )
- ~ Dimensionless
- ~ The Fraction of customer orders filled is determined by the ratio of the \ normal shipment rate to the desired rate. The normal rate is the rate \ current inventory permits under normal circumstances. Low inventory \ availability reduces shipments below customer orders. Unfilled customer \ orders are lost.

|

Finally order fulfillment rate=

Table function of the order fulfillment rate("Max shipment rate-distributor"/"Desired shipment-distributor"\

- )
- ~ Dimensionless
- ~ The Fraction of customer orders filled is determined by the ratio of the \ normal shipment rate to the desired rate. The normal rate is the rate \ current inventory permits under normal circumstances. Low inventory \ availability reduces shipments below customer orders. Unfilled customer \ orders are lost.

|

FR=

collected used products\*Failure percentage/Selecting and disposal time

- ~ unit/Week
- ~ failure rate

|

ICOR=

- 4
- ~ unit/Week
- ~ Initial value of customer orders, set to 4 widgets per week.

|

"Indecated Order-distributor"=

"Desired acquisition rate-distributor" + "Adjustment of pipeline-distributor"

- ~ unit/Week
- ~ Indicated orders are based on the expected loss rate, then adjusted for to close any gap between the desired and actual stock or supply line.

|

Indecated production start rate=

"Desired acquisition rate-producer" + "Adjustment of pipeline -producer"

- ~ unit/Week
- ~ Indicated orders are based on the expected loss rate, then adjusted for to close any gap between the desired and actual stock or supply line.

|

"Indicated order rate-retailer" =

"Desired acquisition rate-retailer" + "Adjustment of pipeline-retailer"

~ unit/Week

~ Indicated orders are based on the expected loss rate, then adjusted for to close any gap between the desired and actual stock or supply line.

|

Input =

1 + STEP(Step Height, Step Time) +

(Pulse Quantity/TIME STEP)\*PULSE(Pulse Time, TIME STEP) +

RAMP(Ramp Slope, Ramp Start Time, Ramp End Time) +

Sine Amplitude\*SIN(2\*3.14159\*Time/Sine Period)

~ Dimensionless

~ Input is a dimensionless variable which provides a variety of test input patterns, \ including a step, pulse, sine wave, and random noise.

|

"Inventory adjustment time-distributor" = 8

~ Week

bring \ The inventory adjustment time is the time period over which the plant seeks to

inventory in

balance with the desired level. Initially set to 8 weeks.

|

"Inventory adjustment time-producer" = 8

~ Week

bring \ The inventory adjustment time is the time period over which the plant seeks to

inventory in

balance with the desired level. Initially set to 8 weeks.

|

"Inventory adjustment time-Retailer" = 8

~ Week

bring \ The inventory adjustment time is the time period over which the plant seeks to

inventory in

balance with the desired level. Initially set to 8 weeks.

|

"Inventory-distributor" = INTEG (

"Acquisition rate-distributor" - "Shipment rate-distributor",

"Desired inventory-distributor")

~ unit  
~ The level of finished goods inventory in the plant. Increased by production and \ decreased by shipments. Initially set to the desired inventory level.

|

"Inventory-producer"= INTEG (  
Aquisition from remanufacturing+"Aquisition rate-producer"- "Shipment rate-producer",  
"Desired inventory-producer")  
~ unit  
~ The level of finished goods inventory in the plant. Increased by production and \ decreased by shipments. Initially set to the desired inventory level.

|

"Inventory-retailer"= INTEG (  
"Aquisition rate-retailer"- "Shipement rate-Retailer",  
"Desired inventory-Retailor")  
~ unit  
~ The level of finished goods inventory in the plant. Increased by production and \ decreased by shipments. Initially set to the desired inventory level.

|

Manufacturing cycle time=

2  
~ Week  
~ The average delay between order and acquisition of new units.

|

"Max acceptable delay-retailer"=  
6  
~ Week  
~ Max acceptable delay

|

"Max aquisition dalay- distributor"=  
6  
~ Week  
~ Max acceptable delay

|

"Max shipment rate-distributor"=  
"Inventory-distributor"/"Min order processing time-distributor"  
~ unit/Week  
~ The maximum rate of shipments the firm can achieve given their current \ inventory level and the minimum order processing time.

|

"Max shipment rate-producer"=

"Inventory-producer"/"Min order processing time-producer"

~ unit/Week

~ The maximum rate of shipments the firm can achieve given their current \ inventory level and the minimum order processing time.

|

"Max shipment rate-Retailer"=

"Inventory-retailer"/"Min ordre processing time-Retailer"

~ unit/Week

~ The maximum rate of shipments the firm can achieve given their current \ inventory level and the minimum order processing time.

|

MB 0(

[(0,-0.15)-(1,0.15)],(0,-0.15),(0.5,0),(1,0.15))

~ Dimensionless

~ |

"Min order processing time-distributor"=

1

~ Week

~ The minimum time required to process and ship an order.

|

"Min order processing time-producer"=

1

~ Week

~ The minimum time required to process and ship an order.

|

"Min ordre processing time-Retailer"=

1

~ Week

~ The minimum time required to process and ship an order.

|

"Order fulfillment rate-producer"=

"Shipment rate-producer"

~ unit/Week

~ The order fulfillment rate is equal to the physical shipment rate.

|

"Order fuufillment-distributor"=

"Shipment rate-distributor"

~ unit/Week  
~ The order fulfillment rate is equal to the physical shipment rate.  
|

"Order rate-Consumer"=  
Order rate0  
~ unit/Week  
~ |

"Order rate-distributor"=  
MAX(0, "Indecated Order-distributor")  
~ unit/Week  
~ |

"Order rate-Producer"=  
Remanufacturing start rate+Production start rate  
~ unit/Week  
~ |

"Order rate-retailer"=  
MAX("Indicated order rate-retailer", 0 )  
~ unit/Week  
~ |

Order rate0=  
ICOR\*Input  
~ unit/Week  
~ |

"Perceived aquisition delay-distributor"= INTEG (  
"Change of Perceived aquisition delay-distributor",  
2)  
~ Week  
~ Perceived\_Aquisition\_Delay of distributor  
|

"Perceived aquisition delay-retailer"= INTEG (  
"change of perceived aquisition delay-retailer",  
2)  
~ Week  
~ Perceived\_Aquisition\_Delay of distributor  
|

"Perceiving time for Perceived aquisition delay-distributor"=  
12  
~ Week  
~ Delivery Delay\_Perception\_Time

|

"Perceiving time for Perceived acquisition delay-retailer"=

12

~ Week

~ Delivery Delay\_Perception\_Time

|

Pipeline inventory= INTEG (

+Production start rate-"Aquisition rate-producer",

"Desired pipeline inventory-producer"/2)

~ unit

~ The quantity on order; what has been ordered but not yet received.

|

"Pipeline inventory-distributor"= INTEG (

+"Order rate-distributor"-"Aquisition rate-distributor",

"Desired pipeline-distributor")

~

~ The quantity on order; what has been ordered but not yet received.

|

"Pipeline inventory-retailer"= INTEG (

+"Order rate-retailer"-"Aquisition rate-retailer",

"Desired Pipeline-Retailer")

~ unit

~ The quantity on order; what has been ordered but not yet received.

|

Production start rate=

MAX(0,Indecated production start rate-Remanufacturing start rate)

~ unit/Week

~ The podustion start rate is constrained to be nonnegative.

|

Pulse Quantity=

0

~ Dimensionless\*Week

~ The quantity to be injected to customer orders, as a fraction of the base value of \ Input.

For example, to pulse in a quantity equal to 50% of the current value of \ input, set to

.50.

|

Pulse Time=5

~ Week

~ Time at which the pulse in Input occurs.  
|

Ramp End Time=1e+009

~ Week  
~ End time for the ramp input.  
|

Ramp Slope=0

~ 1/Week  
~ Slope of the ramp input, as a fraction of the base value (per week).  
|

Ramp Start Time=5

~ Week  
~ Start time for the ramp input.  
|

Real remanufacture capacity expansion rate=

Expansion fraction\*MAX(Desired Remanufacturing capacity-Remanufacturing capacity,  
0\  
)  
~ unit/Week  
~ capacity expansion rate  
|

Remanufacture pipeline product= INTEG (

Remanufacturing start rate-Remanufacturing production rate,  
"Desired pipeline inventory-producer"/2)  
~ unit  
~ remanufacturing pipe line  
|

Remanufacturing capacity= INTEG (

Remanufacturing capacity aquisition rate,  
10)  
~ unit/Week  
~ remanufacturing capacity  
|

Remanufacturing capacity aquisition rate=

DELAY3(Real remanufacture capacity expansion rate, Delay of remanufacturing capacity  
aquisition rate\  
)  
~ unit/Week/Week  
~ capacity add rate  
|

Remanufacturing cycle time=

2  
~ Week  
~ Remanufacturing production delay  
|

Remanufacturing production rate=

DELAY FIXED(Remanufacturing start rate, Remanufacturing cycle time ,  
Remanufacturing start rate\  
)  
~ unit/Week  
~ |

Remanufacturing start rate=

MIN(feasible remanufacturing rate, MAX(0, Indecated production start rate))  
~ unit/Week  
~ |

Reuseable products= INTEG (

Acceptable reusable rate-feasible remanufacturing rate,  
1.6)  
~ unit  
~ reusable products  
|

"Safety inventory coverage-distriutor"=

1  
~ Week  
~ Safety stock coverage is the number of weeks of the expected order rate \  
the firm would like to maintain in inventory over and above the normal \  
order processing time. The safety stock provides a buffer against the \  
possibility that unforeseen variations in demand will cause shipments to \  
fall below orders.  
|

"Safety inventory coverage-Retailer"=

1  
~ Week  
~ Safety stock coverage is the number of weeks of the expected order rate \  
the firm would like to maintain in inventory over and above the normal \  
order processing time. The safety stock provides a buffer against the \  
possibility that unforeseen variations in demand will cause shipments to \  
fall below orders.  
|

"Saftey inventory coverage-producer"=

1  
~ Week  
~ Safety stock coverage is the number of weeks of the expected order rate \ the firm would like to maintain in inventory over and above the normal \ order processing time. The safety stock provides a buffer against the \ possibility that unforeseen variations in demand will cause shipments to \ fall below orders.  
|

Selecting and disposal time=

1  
~ Week  
~ time to selecting  
|

"Shipment rate-Retailer"=

"Desired shipment rate-Retailer"\*"Finally order fulfillment rate-Retailer"  
~ unit/Week  
~ The shipment rate is the desired shipment rate multiplied by the fraction \ of orders filled (the order fulfillment ratio. Shipments fall below \ desired shipments when the feasible shipment rate falls below the desired \ rate, indicating that some products are unavailable.  
|

"Shipment rate-distributor"=

"Desired shipment-distributor"\*"Finally order fulfillment rate"  
~ unit/Week  
~ The shipment rate is the desired shipment rate multiplied by the fraction \ of orders filled (the order fulfillment ratio. Shipments fall below \ desired shipments when the feasible shipment rate falls below the desired \ rate, indicating that some products are unavailable.  
|

"Shipment rate-producer"=

"Desired shipment rate-producer"\*"Finally Oderfulfiiment rate-producer"  
~ unit/Week  
~ |

Sine Amplitude=0

~ Dimensionless  
~ Amplitude of sine wave in customer orders (fraction of mean).  
|

Sine Period=50

~ Weeks  
~ Period of sine wave in customer demand. Set initially to 50 weeks (1 \ year).

|

Step Height=  
0.5

- ~ Dimensionless
  - ~ Height of step input to customer orders, as fraction of initial value.
- |

Step Time=5

- ~ Week
  - ~ Time for the step input.
- |

"Table function of order fulfillment rate-producer"

[(0,0)-(2,1)],(0,0),(0.2,0.2),(0.4,0.4),(0.6,0.58),(0.8,0.73),(1,0.85),(1.2,0.93),(1.4,0.97),(1.6,0.99),(1.8,1),(2,1),(2,1))

- ~ Dimensionless
  - ~ The ability to ship is constrained by inventory availability. As the inventory level drops, the fraction of customer orders that can be filled decreases. When inventory is zero, shipments cease. Unfilled customer orders are lost.!!!
- |

"Table function of order fulfillment-retailer"

[(0,0)-(100,1)],(0,0),(0.2,0.2),(0.4,0.4),(0.6,0.58),(0.8,0.73),(1,0.85),(1.2,0.93),(1.4,0.97),(1.6,0.99),(1.8,1),(2,1),(2,1),(100,1))

- ~ Dimensionless
  - ~ The ability to ship is constrained by inventory availability. As the inventory level drops, the fraction of customer orders that can be filled decreases. When inventory is zero, shipments cease. Unfilled customer orders are lost.!!!
- |

Table function of the order fulfillment rate

[(0,0)-(2,1)],(0,0),(0.2,0.2),(0.4,0.4),(0.6,0.58),(0.8,0.73),(1,0.85),(1.2,0.93),(1.4,0.97),(1.6,0.99),(1.8,1),(2,1),(2,1))

- ~ Dimensionless
  - ~ The ability to ship is constrained by inventory availability. As the inventory level drops, the fraction of customer orders that can be filled decreases. When inventory is zero, shipments cease. Unfilled customer orders are lost.!!!
- |

"Table functionfor Expected aquisition delay- distributor"= WITH LOOKUP (

"Max aquisition dalay- distributor"/"Perceived aquisition delay-distributor",  
((0,0)-(10,1)],(0,1),(0.3,0.98),(0.6,0.93),(0.9,0.85),(1.2,0.7),(1.5,0.57),(1.8,0.46\  
,(2.1,0.39),(2.4,0.35),(2.7,0.33333),(3,0.33333),(10,0.33) )

~

~ |

"Table functionfor Expected aquisition dalay- retailer"= WITH LOOKUP (  
"Max acceptable delay-retailer"/"Perceived aquisition delay-retailer",  
((0,0)-(10,1)],(0,1),(0.3,0.98),(0.6,0.93),(0.9,0.85),(1.2,0.7),(1.5,0.57),(1.8,0.46\  
,(2.1,0.39),(2.4,0.35),(2.7,0.33333),(3,0.33333),(10,0.33) )

~

~ |

"Target delivery delay-distributor"=

2

~ Week

~ The firm's target for delivery time.

|

"Target delivery delay-producer"=

2

~ Week

~ The firm's target for delivery time.

|

"Time for adjustment of pipeline -producer"=

4

~ Week

~ The time period over which the gap between the desired and actual supply \  
line is closed.

|

"Time for adjustment of pipeline-retailer"=

4

~ unit

~ The time period over which the gap between the desired and actual supply \  
line is closed.

|

"Time for pipeline adjustment-distributor"=

4

~ Week

~ The time period over which the gap between the desired and actual supply \  
line is closed.

|

Time for smooth order rate from consumer=

4  
~ Week  
~ |

Time for smooth order rate from distributor=

4  
~ Week  
~ |

Time for smooth the order rate from retailer=

4  
~ Week  
~ |

used products=

DELAY3("Shipement rate-Retailer", useful life )  
~ unit/Week  
~ used products  
|

useful life=

78  
~ Week  
~ USE LIFE  
|

\*\*\*\*\*

.Control

\*\*\*\*\*~

Simulation Control Parameters

|

FINAL TIME = 100

~ Week  
~ The final time for the simulation.  
|

INITIAL TIME = 0

~ Week  
~ The initial time for the simulation.  
|

SAVEPER = 1

~ Week [0,?]  
~ The frequency with which output is stored.  
|

TIME STEP = 0.25

~ Week [0,?]

~ The time step for the simulation.

|

\\---// Sketch information - do not modify anything except names

V300 Do not put anything below this section - it will be ignored

\*View 1

\$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|196,96,100

10,1,"Inventory-retailer",610,52,40,20,3,3,0,0,0,0,0

12,2,48,911,44,10,8,0,3,0,34,-1,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,3,"Adjustment of inventory -Retailer",547,263,68,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,4,"Desired inventory-Retailer",623,332,64,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,5,"Inventory adjustment time-Retailer",532,189,47,27,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,6,"Desired inventory coverage-retailer",763,384,64,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,7,"Finally order fulfillment rate-Retailer",817,147,69,19,8,3,0,0,0,0,0,0

10,8,"Table function of order fulfillment-retailer",957,247,73,19,8,3,0,0,0,0,0,0

12,9,0,678,109,20,20,5,4,0,34,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

B

12,10,0,682,158,50,11,8,0,0,0,0,0,0

1,11,5,3,2,0,45,0,0,192,0,-1--1--1,,1|(493,239)|

1,12,1,3,2,0,45,0,0,192,0,-1--1--1,,1|(598,179)|

1,13,4,3,2,0,43,0,0,192,0,-1--1--1,,1|(615,281)|

1,14,6,4,2,0,43,0,0,0,0,-1--1--1,,1|(673,337)|

1,15,8,7,1,0,0,0,0,0,0,-1--1--1,,1|(839,202)|

10,16,"Desired shipment rate-Retailer",731,-30,58,19,8,3,0,0,0,0,0,0

10,17,"Max shipment rate-Retailer",672,201,45,19,8,3,0,0,0,0,0,0

10,18,"Min order processing time-Retailer",732,279,68,19,8,3,0,0,0,0,0,0

1,19,1,17,1,0,43,0,0,192,0,-1--1--1,,1|(662,152)|

1,20,17,7,1,0,43,0,0,192,0,-1--1--1,,1|(762,184)|

1,21,18,17,1,0,45,0,0,192,0,-1--1--1,,1|(675,247)|

1,22,18,6,1,0,43,0,0,192,0,-1--1--1,,1|(782,327)|

10,23,"Safety inventory coverage-Retailer",877,313,57,19,8,3,0,0,0,0,0,0

1,24,23,6,1,0,43,0,0,192,0,-1--1--1,,1|(839,371)|

10,25,"Desired shipment rate-Retailer",997,138,63,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128

1,26,25,7,1,0,45,0,0,192,0,-1--1--1,,1|(933,155)|

10,27,"Pipeline inventory-retailer",295,53,40,20,3,3,0,0,0,0,0,0

1,28,29,27,100,0,0,22,0,0,0,-1--1--1,,1|(391,50)|

11,29,700,453,50,6,8,34,3,0,0,1,0,0,0

10,30,"Acquisition rate-retailer",453,69,37,19,40,3,0,0,-1,0,0,0

10,31,"Indicated order rate-retailer",128,225,49,19,8,3,0,0,0,0,0,0

10,32,"Adjustment of pipeline-retailer",264,205,49,19,8,3,0,0,0,0,0,0

10,33,"Desired Pipeline-Retailer",381,223,53,19,8,3,0,0,0,0,0  
1,34,32,31,1,0,43,0,0,64,0,-1--1--1,,1|(203,227)|  
1,35,33,32,1,0,43,0,0,192,0,-1--1--1,,1|(319,243)|  
1,36,27,32,1,0,45,0,0,192,0,-1--1--1,,1|(297,108)|  
12,37,0,196,126,20,20,4,4,0,0,-1,0,0,0  
B  
12,38,0,533,117,20,20,4,4,0,0,-1,0,0,0  
B  
12,39,0,193,164,50,11,8,0,0,0,-1,0,0,0  
12,40,0,576,155,50,11,8,0,0,0,-1,0,0,0  
10,41,"Time for adjustment of pipeline-retailer",337,138,72,19,8,3,0,0,0,0,0  
1,42,41,32,1,0,45,0,0,192,0,-1--1--1,,1|(318,190)|  
10,43,"Desired aquistion rate-retailer",411,323,55,19,8,3,0,0,0,0,0  
1,44,43,33,1,0,43,0,0,192,0,-1--1--1,,1|(379,271)|  
1,45,29,1,4,0,0,22,0,0,0,-1--1--1,,1|(514,50)|  
1,46,3,43,1,0,43,0,2,64,0,-1--1--1,|12|0-0-0,1|(502,306)|  
1,47,43,31,1,0,43,0,2,64,0,-1--1--1,|12|0-0-0,1|(281,306)|  
10,48,"Expected order rate-retailer",535,413,50,19,8,3,0,0,0,0,0  
1,49,48,43,1,0,0,0,0,64,0,-1--1--1,,1|(475,391)|  
1,50,48,4,1,0,0,0,0,64,0,-1--1--1,,1|(576,388)|  
10,51,Time for smooth order rate from consumer,486,478,72,19,8,3,0,0,0,0,0  
1,52,51,48,1,0,0,0,0,64,0,-1--1--1,,1|(517,454)|  
12,53,48,60,46,10,8,0,3,0,0,-1,0,0,0  
1,54,56,27,4,0,0,22,0,0,0,-1--1--1,,1|(211,46)|  
1,55,56,53,100,0,0,22,0,0,0,-1--1--1,,1|(113,46)|  
11,56,48,162,46,6,8,34,3,0,0,1,0,0,0  
10,57,"Order rate-retailer",162,65,58,11,40,3,0,0,-1,0,0,0  
1,58,31,57,1,0,0,0,0,64,0,-1--1--1,,1|(127,161)|  
1,59,61,2,4,0,0,22,0,0,0,-1--1--1,,1|(841,44)|  
1,60,61,1,100,0,0,22,0,0,0,-1--1--1,,1|(709,44)|  
11,61,1244,775,44,6,8,34,3,0,0,1,0,0,0  
10,62,"Shipement rate-Retailer",775,63,40,19,40,3,0,0,-1,0,0,0  
1,63,7,62,1,0,0,0,0,64,0,-1--1--1,,1|(806,96)|  
1,64,16,61,1,0,0,0,0,64,0,-1--1--1,,1|(740,3)|  
10,65,"Order rate-Consumer",691,-97,53,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,66,65,16,1,0,0,0,0,64,0,-1--1--1,,1|(712,-66)|  
10,67,"Order rate-Consumer",662,453,53,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,68,67,48,1,0,0,0,0,64,0,-1--1--1,,1|(622,424)|  
10,69,"Shipment rate-distributor",468,-34,73,26,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-  
128  
1,70,69,29,1,0,0,0,0,64,0,-1--1--1,,1|(433,-20)|  
10,71,"Perceived aquistion delay-retailer",319,-124,62,20,3,3,0,0,0,0,0  
12,72,48,557,-121,10,8,0,3,0,0,-1,0,0,0  
1,73,75,71,4,0,0,22,0,0,0,-1--1--1,,1|(415,-124)|  
1,74,75,72,100,0,0,22,0,0,0,-1--1--1,,1|(504,-124)|  
11,75,48,455,-124,6,8,34,3,0,0,1,0,0,0  
10,76,"change of perceived aquistion delay-retailer",455,-105,73,19,40,3,0,0,-1,0,0,0

10,77,"Perceiving time for Perceived aquisition delay-retailer",465,-202,64,28,8,3,0,0,0,0,0  
1,78,77,75,1,0,0,0,0,64,0,-1--1--1,,1|(476,-167)|  
1,79,71,75,1,0,0,0,0,64,0,-1--1--1,,1|(373,-73)|  
10,80,"Max acceptable delay-retailer",176,-208,52,19,8,3,0,0,0,0,0  
10,81,"Table functionfor Expected aquisition dalay- retailer",180,-130,65,28,8,3,0,0,0,0,0  
1,82,71,81,1,0,0,0,0,64,0,-1--1--1,,1|(239,-164)|  
1,83,80,81,1,0,0,0,0,64,0,-1--1--1,,1|(174,-163)|  
10,84,"Expected aquisition dalay- retailer",203,-36,65,19,8,3,0,0,0,0,0  
1,85,80,84,1,0,0,0,0,64,0,-1--1--1,,1|(131,-156)|  
1,86,81,84,1,0,0,0,0,64,0,-1--1--1,,1|(204,-98)|  
10,87,"Delivery delay-distributor",342,-217,34,21,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-  
128-128  
1,88,87,75,1,0,0,0,0,64,0,-1--1--1,,1|(363,-186)|  
10,89,"Delivery delay-producer",1176,-278,62,14,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-  
128-128  
10,90,"Expected aquisition dalay- retailer",441,155,70,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-  
0,|12||128-128-128  
1,91,90,33,1,0,0,0,0,64,0,-1--1--1,,1|(430,194)|  
1,94,4,1,0,0,0,0,0,0,1,-1--1--1,,1|(616,199)|  
1,95,33,27,0,0,0,0,0,0,1,-1--1--1,,1|(341,144)|

\\---// Sketch information - do not modify anything except names

V300 Do not put anything below this section - it will be ignored

\*View 2

\$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|196,96,100

10,1,"Inventory-distributor",680,31,40,20,3,3,0,0,0,0,0

12,2,48,981,23,10,8,0,3,0,34,-1,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

11,3,48,850,28,6,8,34,3,0,0,1,0,0,0

10,4,"Shipment rate-distributor",850,46,54,18,40,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

10,5,"Adjustment of inventory-distributor",619,242,71,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-  
0,Helvetica|12||0-0-0

10,6,"Desired inventory-distributor",709,304,71,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-  
0,Helvetica|12||0-0-0

10,7,"Inventory adjustment time-distributor",604,168,73,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-  
0,Helvetica|12||0-0-0

10,8,"Desired inventory coverage-distributor",904,304,80,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-  
0,Helvetica|12||0-0-0

10,9,Finally order fulfillment rate,844,154,44,19,8,3,0,0,0,0,0,0

10,10,Table function of the order fulfillment rate,1023,228,65,19,8,3,0,0,0,0,0,0

12,11,0,748,88,20,20,5,4,0,34,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0

B

1,12,3,2,4,0,0,22,0,0,0,-1--1--1,,1|(913,28)|

1,13,3,1,100,0,0,22,0,0,0,-1--1--1,,1|(782,28)|

1,14,7,5,2,0,45,0,0,192,0,-1--1--1,,1|(565,218)|

1,15,1,5,2,0,45,0,0,192,0,-1--1--1,,1|(668,158)|

1,16,6,5,2,0,43,0,0,192,0,-1--1--1,,1|(685,260)|

1,17,8,6,2,0,43,0,0,0,0,-1--1--1,,1|(743,316)|

1,18,9,4,2,0,43,0,0,192,0,-1--1--1,,1|(859,95)|

1,19,10,9,1,0,0,0,0,0,0,-1--1--1,,1|(880,213)|  
10,20,"Desired shipment-distributor",794,-66,64,19,8,3,0,0,0,0,0,0  
10,21,"Max shipment rate-distributor",715,179,48,19,8,3,0,0,0,0,0,0  
10,22,"Min order processing time-distributor",783,239,68,19,8,3,0,0,0,0,0,0  
1,23,1,21,1,0,43,0,0,192,0,-1--1--1,,1|(712,132)|  
1,24,21,9,1,0,43,0,0,192,0,-1--1--1,,1|(792,175)|  
1,25,22,21,1,0,45,0,0,192,0,-1--1--1,,1|(727,219)|  
1,26,22,8,1,0,43,0,0,192,0,-1--1--1,,1|(875,226)|  
10,27,"Safety inventory coverage-distributor",1016,350,60,19,8,3,0,0,0,0,0,0  
1,28,27,8,1,0,43,0,0,192,0,-1--1--1,,1|(955,350)|  
10,29,"Backlog-distributor",852,-170,40,20,3,3,0,0,0,0,0,0  
12,30,48,688,-171,10,8,0,3,0,0,-1,0,0,0  
1,31,33,29,4,0,0,22,0,0,0,-1--1--1,,1|(781,-171)|  
1,32,33,30,100,0,0,22,0,0,0,-1--1--1,,1|(718,-171)|  
11,33,48,744,-171,6,8,34,3,0,0,1,0,0,0  
10,34,"Consumer order rate-distributor",744,-152,53,19,40,3,0,0,-1,0,0,0  
12,35,48,1009,-173,10,8,0,3,0,0,-1,0,0,0  
1,36,38,35,4,0,0,22,0,0,0,-1--1--1,,1|(977,-173)|  
1,37,38,29,100,0,0,22,0,0,0,-1--1--1,,1|(917,-173)|  
11,38,48,949,-173,6,8,34,3,0,0,1,0,0,0  
10,39,"Order fulfillment-distributor",949,-154,67,19,40,3,0,0,-1,0,0,0  
1,40,20,3,1,0,43,0,0,64,0,-1--1--1,,1|(802,-25)|  
1,41,29,20,1,0,43,0,0,192,0,-1--1--1,,1|(810,-134)|  
1,42,3,39,1,0,43,0,0,192,0,-1--1--1,,1|(969,-59)|  
10,43,"Target delivery delay-distributor",652,-46,53,19,8,3,0,0,0,0,0,0  
1,44,43,20,1,0,45,0,0,192,0,-1--1--1,,1|(724,-105)|  
12,45,0,871,-83,20,20,5,4,0,34,0,0,0,0,-1--1--1,0-0-0,Helvetica12||0-0-0

B

10,46,"Desired shipment-distributor",977,147,68,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,112||128-128-128  
1,47,46,9,1,0,45,0,0,192,0,-1--1--1,,1|(930,157)|  
10,48,"Pipeline inventory-distributor",308,34,40,20,3,3,0,0,0,0,0,0  
1,49,50,48,100,0,0,22,0,0,0,-1--1--1,,1|(415,31)|  
11,50,604,489,31,6,8,34,3,0,0,1,0,0,0  
10,51,"Acquisition rate-distributor",489,50,48,19,40,3,0,0,-1,0,0,0  
10,52,"Indecated Order-distributor",141,206,55,19,8,3,0,0,0,0,0,0  
10,53,"Adjustment of pipeline-distributor",277,186,60,19,8,3,0,0,0,0,0,0  
10,54,"Desired pipeline-distributor",401,210,60,19,8,3,0,0,0,0,0,0  
1,55,53,52,1,0,43,0,0,64,0,-1--1--1,,1|(216,208)|  
1,56,54,53,1,0,43,0,0,192,0,-1--1--1,,1|(334,231)|  
1,57,48,53,1,0,45,0,0,192,0,-1--1--1,,1|(310,89)|  
12,58,0,209,107,20,20,4,4,0,0,-1,0,0,0

B

12,59,0,605,96,20,20,4,4,0,0,-1,0,0,0

B

10,60,"Time for pipeline adjustment-distributor",350,119,70,19,8,3,0,0,0,0,0,0  
1,61,60,53,1,0,45,0,0,192,0,-1--1--1,,1|(331,171)|

10,62,"Desired aquisition rate-distributor",424,304,57,19,8,3,0,0,0,0,0  
1,63,62,54,1,0,43,0,0,192,0,-1--1--1,,1|(398,254)|  
1,64,50,1,4,0,0,22,0,0,0,-1--1--1,,1|(567,31)|  
1,65,5,62,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(515,287)|  
1,66,62,52,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(294,287)|  
10,67,Expected order rate from retailer,605,392,64,19,8,3,0,0,0,0,0  
1,68,67,62,1,0,0,0,0,64,0,-1--1--1,,1|(486,372)|  
1,69,67,6,1,0,0,0,0,64,0,-1--1--1,,1|(654,367)|  
10,70,Time for smooth the order rate from retailer,556,457,72,19,8,3,0,0,0,0,0  
1,71,70,67,1,0,0,0,0,64,0,-1--1--1,,1|(587,433)|  
12,72,48,87,34,10,8,0,3,0,0,-1,0,0,0  
1,73,75,48,4,0,0,22,0,0,0,-1--1--1,,1|(228,34)|  
1,74,75,72,100,0,0,22,0,0,0,-1--1--1,,1|(136,34)|  
11,75,48,182,34,6,8,34,3,0,0,1,0,0,0  
10,76,"Order rate-distributor",182,53,48,19,40,3,0,0,-1,0,0,0  
1,77,52,76,1,0,0,0,0,64,0,-1--1--1,,1|(127,132)|  
10,78,"Order rate-retailer",607,-116,42,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
10,79,"Order rate-retailer",692,462,42,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,80,78,34,1,0,0,0,0,64,0,-1--1--1,,1|(683,-100)|  
1,81,79,67,1,0,0,0,0,64,0,-1--1--1,,1|(648,417)|  
10,82,"Shipment rate-producer",463,-60,57,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,83,82,51,1,0,0,0,0,0,0,-1--1--1,,1|(504,-19)|  
10,84,"Delivery delay-distributor",872,-247,53,19,8,3,0,0,0,0,0  
1,85,29,84,1,0,0,0,0,64,0,-1--1--1,,1|(852,-213)|  
10,86,"Perceived aquisition delay-distributor",373,-170,51,20,3,3,0,0,0,0,0  
12,87,48,563,-164,10,8,0,3,0,0,-1,0,0,0  
1,88,90,86,4,0,0,22,0,0,0,-1--1--1,,1|(455,-163)|  
1,89,90,87,100,0,0,22,0,0,0,-1--1--1,,1|(525,-163)|  
11,90,48,492,-163,6,8,34,3,0,0,1,0,0,0  
10,91,"Change of Perceived aquisition delay-distributor",492,-126,82,29,40,3,0,0,-1,0,0,0  
10,92,"Delivery delay-producer",401,-249,54,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,94,92,91,1,0,0,0,0,64,0,-1--1--1,,1|(445,-209)|  
1,95,93,90,1,0,0,0,0,64,0,-1--1--1,,1|(514,-214)|  
1,96,86,90,1,0,0,0,0,64,0,-1--1--1,,1|(413,-86)|  
10,97,"Max aquisition dalay- distributor",290,-251,55,19,8,3,0,0,0,0,0  
10,98,"Table functionfor Expected aquisition dalay- distributor",235,-168,86,28,8,3,0,0,0,0,0  
1,99,86,98,1,0,0,0,0,64,0,-1--1--1,,1|(312,-120)|  
1,100,97,98,1,0,0,0,0,64,0,-1--1--1,,1|(252,-208)|  
10,101,"Expected aquisition dalay- distributor",183,-92,65,19,8,3,0,0,0,0,0  
1,102,97,101,1,0,0,0,0,64,0,-1--1--1,,1|(210,-246)|  
1,103,98,101,1,0,0,0,0,64,0,-1--1--1,,1|(226,-131)|  
10,104,"Expected aquisition dalay- distributor",468,145,70,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,105,104,54,1,0,0,0,0,64,0,-1--1--1,,1|(445,195)|

1,106,38,84,1,0,0,0,0,64,0,-1--1--1,,1|(947,-202)|  
 1,107,6,1,0,0,0,0,0,1,-1--1--1,,1|(695,175)|  
 1,108,54,48,0,0,0,0,0,1,-1--1--1,,1|(357,128)|  
 \\---// Sketch information - do not modify anything except names  
 V300 Do not put anything below this section - it will be ignored  
 \*View 3  
 \$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|196,96,100  
 10,1,"Inventory-producer",746,349,40,20,3,3,0,0,0,0,0  
 10,2,"Adjustment inventory-producer",685,560,68,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0  
 10,3,"Desired inventory-producer",726,635,68,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0  
 10,4,"Inventory adjustment time-producer",670,476,52,27,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0  
 10,5,"Desired inventory coverage-producer",890,639,70,18,8,3,0,32,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0  
 10,6,"Finally Oderfulliiment rate-producer",910,472,69,19,8,3,0,0,0,0,0,0  
 10,7,"Table function of order fulfillment rate-producer",1018,543,76,19,8,3,0,0,0,0,0,0  
 12,8,0,814,406,20,20,5,4,0,34,0,0,0,0,-1--1--1,0-0-0,Helvetica|12||0-0-0  
 B  
 1,9,4,2,2,0,45,0,0,192,0,-1--1--1,,1|(631,536)|  
 1,10,1,2,2,0,45,0,0,192,0,-1--1--1,,1|(734,476)|  
 1,11,3,2,2,0,43,0,0,192,0,-1--1--1,,1|(751,578)|  
 1,12,5,3,2,0,43,0,0,0,0,-1--1--1,,1|(809,634)|  
 1,13,7,6,1,0,0,0,0,0,0,-1--1--1,,1|(931,508)|  
 10,14,"Desired shipment rate-producer",898,267,55,19,8,3,0,0,0,0,0,0  
 10,15,"Max shipment rate-producer",762,498,45,19,8,3,0,0,0,0,0,0  
 10,16,"Min order processing time-producer",849,557,68,19,8,3,0,0,0,0,0,0  
 1,17,1,15,1,0,43,0,0,192,0,-1--1--1,,1|(765,452)|  
 1,18,15,6,1,0,43,0,0,192,0,-1--1--1,,1|(851,497)|  
 1,19,16,15,1,0,45,0,0,192,0,-1--1--1,,1|(780,546)|  
 1,20,16,5,1,0,43,0,0,192,0,-1--1--1,,1|(893,591)|  
 10,21,"Saftey inventory coverage-producer",1036,607,61,19,8,3,0,0,0,0,0,0  
 1,22,21,5,1,0,43,0,0,192,0,-1--1--1,,1|(976,657)|  
 10,23,"Backlog-producer",918,148,40,20,3,3,0,0,0,0,0,0  
 12,24,48,754,147,10,8,0,3,0,0,-1,0,0,0  
 1,25,27,23,4,0,0,22,0,0,0,-1--1--1,,1|(848,140)|  
 1,26,27,24,100,0,0,22,0,0,0,-1--1--1,,1|(785,140)|  
 11,27,48,813,140,6,8,34,3,0,0,1,0,0,0  
 10,28,"Consumer order rate-producer",813,161,53,19,40,131,0,0,-1,0,0,0  
 12,29,48,1075,145,10,8,0,3,0,0,-1,0,0,0  
 1,30,32,29,4,0,0,22,0,0,0,-1--1--1,,1|(1043,145)|  
 1,31,32,23,100,0,0,22,0,0,0,-1--1--1,,1|(983,145)|  
 11,32,48,1015,145,6,8,34,3,0,0,1,0,0,0  
 10,33,"Order fulfillment rate-producer",1015,164,52,19,40,3,0,0,-1,0,0,0  
 1,34,23,14,1,0,43,0,0,192,0,-1--1--1,,1|(890,197)|  
 10,35,"Target delivery delay-producer",808,223,49,19,8,3,0,0,0,0,0,0

1,36,35,14,1,0,45,0,0,192,0,-1--1--1,,1|(869,224)|  
12,37,0,962,227,20,20,5,4,0,34,0,0,0,0,-1--1--1,0-0-0,Helvetical12||0-0-0  
B  
10,38,"Desired shipment rate-producer",1091,453,60,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,12||128-128-128  
1,39,38,6,1,0,45,0,0,192,0,-1--1--1,,1|(1028,474)|  
10,40,Pipeline inventory,374,352,40,20,3,3,0,0,0,0,0,0  
12,41,48,155,351,10,8,0,3,0,0,-1,0,0,0  
1,42,44,40,4,0,0,22,0,0,0,-1--1--1,,1|(289,352)|  
1,43,44,41,100,0,0,22,0,0,0,-1--1--1,,1|(198,352)|  
11,44,48,238,352,6,8,34,3,0,0,1,0,0,0  
10,45,Production start rate,238,371,47,19,40,3,0,0,-1,0,0,0  
1,46,47,40,100,0,0,22,0,0,0,-1--1--1,,1|(481,349)|  
11,47,796,555,349,6,8,34,3,0,0,1,0,0,0  
10,48,"Aquisition rate-producer",555,368,45,19,40,3,0,0,-1,0,0,0  
10,49,Indecated production start rate,227,532,65,19,8,3,0,0,0,0,0,0  
10,50,"Adjustment of pipeline -producer",347,499,59,19,8,3,0,0,0,0,0,0  
10,51,"Desired pipeline inventory-producer",454,529,61,19,8,3,0,0,0,0,0,0  
1,52,50,49,1,0,43,0,0,64,0,-1--1--1,,1|(294,525)|  
1,53,51,50,1,0,43,0,0,192,0,-1--1--1,,1|(401,539)|  
1,54,40,50,1,0,45,0,0,192,0,-1--1--1,,1|(377,405)|  
12,55,0,287,425,20,20,4,4,0,0,-1,0,0,0  
B  
12,56,0,671,414,20,20,4,4,0,0,-1,0,0,0  
B  
10,57,"Time for adjustment of pipeline -producer",445,426,72,19,8,3,0,0,0,0,0,0  
1,58,57,50,1,0,45,0,0,192,0,-1--1--1,,1|(421,493)|  
10,59,"Expected aquisition rate-producer",552,489,65,19,8,3,0,0,0,0,0,0  
1,60,59,51,1,0,43,0,0,192,0,-1--1--1,,1|(524,543)|  
10,61,"Desired aquisition rate-producer",490,622,57,19,8,3,0,0,0,0,0,0  
1,62,61,51,1,0,43,0,0,192,0,-1--1--1,,1|(456,575)|  
1,63,47,1,4,0,0,22,0,0,0,-1--1--1,,1|(633,349)|  
1,64,2,61,1,0,43,0,2,64,0,-1--1--1,12||0-0-0,1|(581,605)|  
1,65,61,49,1,0,43,0,2,64,0,-1--1--1,12||0-0-0,1|(370,605)|  
10,66,Manufacturing cycle time,539,268,46,19,8,3,0,0,0,0,0,0  
1,67,66,47,1,0,0,0,0,64,0,-1--1--1,,1|(548,307)|  
10,68,Manufacturing cycle time,554,419,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,12||128-128-128  
1,69,68,59,1,0,0,0,0,64,0,-1--1--1,,1|(560,445)|  
10,70,Expected order rate from distributor,671,710,64,19,8,3,0,0,0,0,0,0  
1,71,70,61,1,0,0,0,0,64,0,-1--1--1,,1|(552,690)|  
1,72,70,3,1,0,0,0,0,64,0,-1--1--1,,1|(697,684)|  
10,73,Time for smooth order rate from distributor,644,779,72,19,8,3,0,0,0,0,0,0  
1,74,73,70,1,0,0,0,0,64,0,-1--1--1,,1|(664,750)|  
10,75,"Order rate-distributor",636,75,53,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,12||128-128-128  
10,76,"Order rate-distributor",778,760,53,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,12||128-128-128  
1,77,75,28,1,0,0,0,0,64,0,-1--1--1,,1|(713,103)|

1,78,76,70,1,0,0,0,0,64,0,-1--1--1,,1|(761,713)|  
12,79,48,1010,342,10,8,0,3,0,0,-1,0,0,0  
1,80,82,79,4,0,0,22,0,0,0,-1--1--1,,1|(953,345)|  
1,81,82,1,100,0,0,22,0,0,0,-1--1--1,,1|(840,345)|  
11,82,48,900,345,6,8,34,3,0,0,1,0,0,0  
10,83,"Shipment rate-producer",900,364,45,19,40,3,0,0,-1,0,0,0  
1,84,14,82,0,0,0,0,0,64,0,-1--1--1,,1|(898,305)|  
1,85,82,33,1,0,0,0,0,64,0,-1--1--1,,1|(978,307)|  
1,86,6,83,1,0,0,0,0,64,0,-1--1--1,,1|(928,409)|  
10,87,Remanufacture pipeline product,402,737,58,19,3,3,0,0,0,0,0,0  
12,88,48,218,740,10,8,0,3,0,0,-1,0,0,0  
1,89,91,87,4,0,0,22,0,0,0,-1--1--1,,1|(311,741)|  
1,90,91,88,100,0,0,22,0,0,0,-1--1--1,,1|(247,741)|  
11,91,48,273,741,6,8,34,3,0,0,1,0,0,0  
10,92,Remanufacturing start rate,273,760,53,19,40,3,0,0,-1,0,0,0  
12,93,48,575,735,10,8,0,3,0,0,-1,0,0,0  
1,94,117,93,4,0,0,22,0,0,0,-1--1--1,,1|(546,736)|  
1,95,87,50,1,0,0,0,0,64,0,-1--1--1,,1|(358,626)|  
1,96,44,47,1,0,0,0,0,64,0,-1--1--1,,1|(408,312)|  
1,97,49,45,1,0,0,0,0,64,0,-1--1--1,,1|(228,498)|  
1,98,49,91,1,0,0,0,0,64,0,-1--1--1,,1|(261,611)|  
1,99,91,45,1,0,0,0,0,64,0,-1--1--1,,1|(216,648)|  
10,100,Remanufacturing cycle time,486,859,53,19,8,3,0,0,0,0,0,0  
12,101,48,737,206,10,8,0,3,0,0,-1,0,0,0  
1,102,104,1,4,0,0,22,0,0,0,-1--1--1,,1|(740,305)|  
1,103,104,101,100,0,0,22,0,0,0,-1--1--1,,1|(740,241)|  
11,104,48,740,275,8,6,33,3,0,0,4,0,0,0  
10,105,Aquisition from remanufacturing,798,275,50,19,40,3,0,0,-1,0,0,0  
10,106,feasible remanufacturing rate,243,842,69,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,107,106,92,0,0,0,0,0,0,0,-1--1--1,,1|(254,807)|  
10,108,Remanufacturing cycle time,568,559,58,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128  
1,109,108,59,1,0,0,0,0,64,0,-1--1--1,,1|(569,529)|  
10,110,"Order rate-Producer",93,542,45,19,8,3,0,0,0,0,0,0  
1,111,45,110,1,0,0,0,0,64,0,-1--1--1,,1|(150,420)|  
1,112,91,110,1,0,0,0,0,64,0,-1--1--1,,1|(223,723)|  
10,113,"Delivery delay-producer",958,66,49,19,8,3,0,0,0,0,0,0  
1,114,23,113,1,0,0,0,0,64,0,-1--1--1,,1|(907,111)|  
1,115,32,113,1,0,0,0,0,64,0,-1--1--1,,1|(1017,123)|  
1,116,117,87,100,0,0,22,0,0,0,-1--1--1,,1|(488,736)|  
11,117,1020,522,736,6,8,34,3,0,0,1,0,0,0  
10,118,Remanufacturing production rate,522,763,53,19,40,3,0,0,-1,0,0,0  
1,119,100,118,1,0,0,0,0,64,0,-1--1--1,,1|(523,817)|  
1,120,92,118,1,0,0,0,0,64,0,-1--1--1,,1|(313,801)|  
10,121,Remanufacturing production rate,606,206,58,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128

1,122,121,104,1,0,0,0,0,64,0,-1--1--1,,1|(669,249)|  
1,126,3,1,0,0,0,0,0,1,-1--1--1,,1|(735,499)|  
1,127,51,40,0,0,0,0,0,1,-1--1--1,,1|(417,447)|  
1,128,51,87,0,0,0,0,0,1,-1--1--1,,1|(429,626)|  
\\---/// Sketch information - do not modify anything except names  
V300 Do not put anything below this section - it will be ignored  
\*View 4  
\$192-192-192,0,Times New Roman|12|0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|196,96,100  
10,1,ICOR,198,242,22,11,8,3,0,48,0,0,0,0,-1--1--1,0-0-0,Helvetica|12|B|0-0-0  
10,2,"Order rate-Consumer",522,199,96,11,8,3,0,0,0,0,0,0  
10,3,Order rate0,346,198,38,11,8,3,0,0,0,0,0,0  
1,4,1,3,1,0,0,0,0,64,0,-1--1--1,,1|(261,246)|  
1,5,3,2,1,0,0,0,0,64,0,-1--1--1,,1|(388,188)|  
10,6,Input,314,370,18,11,0,3,0,0,-1,0,0,0  
10,7,TIME STEP,764,27,50,11,0,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12|B|128-128-128  
10,8,Pulse Quantity,402,331,46,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,9,Pulse Time,409,367,35,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,10,Ramp End Time,250,459,51,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,11,Ramp Slope,214,401,40,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,12,Ramp Start Time,212,431,54,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,13,Sine Amplitude,419,395,48,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,14,Sine Period,406,433,37,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,15,Step Height,319,474,38,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,16,Step Time,372,454,33,11,0,3,0,1,-1,0,0,0,128-128-128,0-0-0,|12|B|0-0-0  
10,17,Time,210,352,26,11,0,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12|B|128-128-128  
10,18,TIME STEP,210,377,50,11,0,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12|B|128-128-128  
1,19,8,6,0,0,0,0,0,0,-1--1--1,,1|(361,349)|  
1,20,9,6,0,0,0,0,0,0,-1--1--1,,1|(359,368)|  
1,21,10,6,0,0,0,0,0,0,-1--1--1,,1|(277,420)|  
1,22,11,6,0,0,0,0,0,0,-1--1--1,,1|(265,384)|  
1,23,12,6,0,0,0,0,0,0,-1--1--1,,1|(257,403)|  
1,24,13,6,1,0,0,0,0,0,0,-1--1--1,,1|(349,381)|  
1,25,14,6,0,0,0,0,0,0,-1--1--1,,1|(365,405)|  
1,26,15,6,0,0,0,0,0,0,-1--1--1,,1|(316,428)|  
1,27,16,6,0,0,0,0,0,0,-1--1--1,,1|(347,417)|  
1,28,17,6,0,0,0,0,0,0,-1--1--1,,1|(259,359)|  
1,29,18,6,0,0,0,0,0,0,-1--1--1,,1|(271,373)|  
10,30,Input,239,141,27,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12|128-128-128  
1,31,30,3,1,0,0,0,0,64,0,-1--1--1,,1|(295,169)|  
12,32,0,1018,149,150,150,3,44,0,0,1,0,0,0  
INVENTORY\_IN\_EVERY\_STAGE  
12,33,0,1024,461,150,150,3,44,0,0,1,0,0,0  
ORDERS\_OF\_EVERY\_STAGE  
\\---/// Sketch information - do not modify anything except names  
V300 Do not put anything below this section - it will be ignored  
\*View 5  
\$192-192-192,0,Times New Roman|12|0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|196,96,100

10,1,collected used products,849,334,44,19,3,3,0,0,0,0,0,0  
 10,2,Reuseable products,612,339,40,20,3,3,0,0,0,0,0,0  
 10,3,Remanufacturing capacity,324,331,40,20,3,3,0,0,0,0,0,0  
 12,4,48,1014,335,10,8,0,3,0,0,-1,0,0,0  
 1,5,7,1,4,0,0,22,0,0,0,-1--1--1,,1|(919,333)|  
 1,6,7,4,100,0,0,22,0,0,0,-1--1--1,,1|(981,333)|  
 11,7,48,952,333,6,8,34,3,0,0,1,0,0,0  
 10,8,collection rate,952,352,44,11,40,3,0,0,-1,0,0,0  
 1,9,11,2,4,0,0,22,0,0,0,-1--1--1,,1|(693,339)|  
 1,10,11,1,100,0,0,22,0,0,0,-1--1--1,,1|(775,339)|  
 11,11,1148,740,339,6,8,34,3,0,0,1,0,0,0  
 10,12,Acceptable reusable rate,740,366,41,19,40,3,0,0,-1,0,0,0  
 1,13,14,1,100,0,0,22,0,0,0,-1--1--1,,1|(845,392)|  
 11,14,204,845,439,6,8,34,3,0,0,1,0,0,0  
 10,15,FR,845,458,12,11,40,3,0,0,-1,0,0,0  
 1,16,17,2,100,0,0,22,0,0,0,-1--1--1,,1|(473,339)|  
 11,17,1164,473,262,8,6,33,3,0,0,4,0,0,0  
 10,18,feasible remanufacturing rate,546,262,65,19,40,3,0,0,-1,0,0,0  
 12,19,48,164,333,10,8,0,3,0,0,-1,0,0,0  
 1,20,22,3,4,0,0,22,0,0,0,-1--1--1,,1|(254,333)|  
 1,21,22,19,100,0,0,22,0,0,0,-1--1--1,,1|(193,333)|  
 11,22,48,219,333,6,8,34,3,0,0,1,0,0,0  
 10,23,Remanufacturing capacity aquisition rate,219,360,71,19,40,3,0,0,-1,0,0,0  
 10,24,Desired Remanufacturing capacity,413,500,80,19,8,3,0,0,0,0,0,0  
 10,25,Real remanufacture capacity expansion rate,296,428,74,19,8,3,0,0,0,0,0,0  
 10,26,Expansion fraction,225,492,58,11,8,3,0,0,0,0,0,0  
 10,27,Failure percentage,786,428,58,11,8,3,0,0,0,0,0,0  
 10,28,collection capacity,946,471,58,11,8,3,0,0,0,0,0,0  
 10,29,Environment policy pressure,1053,494,58,19,8,3,0,0,0,0,0,0  
 10,30,Effect on the collection,1058,427,41,19,8,3,0,0,0,0,0,0  
 10,31,used products,1002,261,45,11,8,3,0,0,0,0,0,0  
 1,32,25,23,1,0,0,0,0,64,0,-1--1--1,,1|(286,404)|  
 1,33,3,25,1,0,0,0,0,64,0,-1--1--1,,1|(320,379)|  
 1,34,24,25,1,0,0,0,0,64,0,-1--1--1,,1|(360,464)|  
 1,35,26,25,1,0,0,0,0,64,0,-1--1--1,,1|(264,469)|  
 1,36,28,8,1,0,0,0,0,64,0,-1--1--1,,1|(949,428)|  
 1,37,30,8,1,0,0,0,0,64,0,-1--1--1,,1|(1005,386)|  
 1,38,29,30,1,0,0,0,0,64,0,-1--1--1,,1|(1044,466)|  
 1,39,31,7,1,0,0,0,0,64,0,-1--1--1,,1|(970,294)|  
 1,40,1,14,1,0,0,0,0,64,0,-1--1--1,,1|(866,391)|  
 1,41,1,12,1,0,0,0,0,64,0,-1--1--1,,1|(794,371)|  
 1,42,27,12,1,0,0,0,0,64,0,-1--1--1,,1|(752,397)|  
 1,43,27,14,1,0,0,0,0,64,0,-1--1--1,,1|(820,429)|  
 1,44,12,24,1,0,0,0,0,64,0,-1--1--1,,1|(589,491)|  
 1,45,3,17,1,0,0,0,0,64,0,-1--1--1,,1|(422,319)|  
 10,46,"Shipement rate-Retailer",1045,175,45,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,128|128-128-128

1,47,46,31,1,0,0,0,0,64,0,-1--1--1,,1|(1016,209)|  
10,48,useful life,1110,220,30,11,8,3,0,0,0,0,0,0  
1,49,48,31,1,0,0,0,0,64,0,-1--1--1,,1|(1056,237)|  
10,50,Delay of desired Remanufacturing capacity,323,581,53,28,8,3,0,0,0,0,0,0  
10,51,Delay of remanufacturing capacity aquisition rate,225,111,79,19,8,3,0,0,0,0,0,0  
1,52,50,24,1,0,0,0,0,64,0,-1--1--1,,1|(357,537)|  
10,53,Selecting and diposal time,745,514,43,19,8,3,0,0,0,0,0,0  
1,54,53,12,1,0,0,0,0,64,0,-1--1--1,,1|(720,429)|  
1,55,53,14,1,0,0,0,0,64,0,-1--1--1,,1|(771,511)|  
12,56,48,851,531,10,8,0,3,0,0,-1,0,0,0  
1,57,14,56,4,0,0,22,0,0,0,-1--1--1,,1|(845,485)|  
10,58,Average time of prepare for remanufacturing,482,424,78,19,8,3,0,0,0,0,0,0  
1,59,58,17,1,0,0,0,0,64,0,-1--1--1,,1|(489,338)|  
1,60,2,18,1,0,0,0,0,64,0,-1--1--1,,1|(581,269)|  
12,61,48,477,178,10,8,0,3,0,0,-1,0,0,0  
1,62,17,61,4,0,0,22,0,0,0,-1--1--1,,1|(473,221)|  
1,63,51,23,1,0,0,0,0,64,0,-1--1--1,,1|(216,181)|