Steps:

Step 1: Industry receives the empty glass bottles and raw soda ingredients.

Step 2: the glass bottles are verified in a machine and are thoroughly washed which is filling in the soap water and draining out and then filling in the fresh water and draining out

Step 3: the bottles are left to dry and soda making starts

Step 4: the prepared soda is filled into the dried glass bottle with the help of soda filling machine

Step 5: the filled soda is sent into the soda level verification machine and the unfilled or bad soda bottles are segregated out

Step 6: the verified soda bottles are capped and labeled and then sent into the packaging

Step 7: the packaging is done and sent to the distributors

State Diagram

If the glass bottles are not empty

If the glass bottles are not verified

If soda is not made

Bottles are empty

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

Packing is done and new empty bottles are collected

Bottles passed verification

Trash is present

Packing is not done

Recycle and collect empty bottles

Soda is made

Bottles are not capped

Bottles are not verified

Bottles are not verified

Soda is not filled

Bottles failed verification

Bottles failed verification

Bottles failed verification

verification=0 bottle\_verify=1



Soda is filled

Bottles passed verification

Bottles are capped and labeled

Bottles passed verification

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

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Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=1 bottle\_verify=1

verification=0 bottle\_verify=1 trash=1

trash=1

Packing=0

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

**Empty\_bottles=0**

Soda=0

**Empty\_bottles=1**

Make the soda

**Collect the empty glass bottles**

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=0 bottle\_verify=1trash=1

trash=1

Packing=0

verification=0 bottle\_verify=1

empty\_bottles=0 trash=0

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=0 bottle\_verify=1

Packing=1

verification=1 bottle\_verify=1 packing=0

verification=1 bottle\_verify=1

Soda=1

Bottle\_verify=0

Bottle\_verify=0

**Bottle\_verify=0**

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

**Verify the bottles for shape and quality**

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=0 bottle\_verify=1 trash=1

trash=1

Packing=0

**verification=0 bottle\_verify=1**

empty\_bottles=0 trash=0

**verification=1 bottle\_verify=1**

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=0 bottle\_verify=1

Packing=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

**Soda=0**

Empty\_bottles=1

**Make the soda**

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=1 bottle\_verify=1

verification=0 bottle\_verify=1 trash=1

trash=1

Packing=0

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

**Soda=1**

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

**Fill the soda into the empty bottles**

Pack and ship the bottles

verification=1 bottle\_verify=1

trash=1

verification=0 bottle\_verify=1 trash=1

Packing=0

**Soda\_fill=0**

**Soda\_fill=1**

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

**Verify the soda filled bottles**

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=1 bottle\_verify=1

Packing=0

trash=1

**verification=0 bottle\_verify=1 trash=1**

**Bottle\_verify=0**

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

Soda\_fill=0

Soda\_fill=1

**verification=1 bottle\_verify=1**

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

**Cap and label the filled bottles**

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=1 bottle\_verify=1

trash=1

Packing=0

verification=0 bottle\_verify=1 trash=1

**Cap=1**

**Verification=1**

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

**Cap=0**

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

**Verify the completely final product**

Throw into Trash/Recycle

Fill the soda into the empty bottles

Pack and ship the bottles

verification=1 bottle\_verify=1

verification=0 bottle\_verify=1 trash=1

trash=1

empty\_bottles=0 trash=0

**verification=0 bottle\_verify=1 trash=1**

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

**verification=1 bottle\_verify=1 packing=0**

Soda=1

**Bottle\_verify=0**

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

Throw into Trash/Recycle

Fill the soda into the empty bottles

**Pack and ship the bottles**

verification=1 bottle\_verify=1

verification=0 bottle\_verify=1 trash=1

**packing=0**

trash=1

empty\_bottles=0 trash=0

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



**Packing=1 empty\_bottles=0**

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

Bottle\_verify=0

Empty\_bottles=0

Soda=0

Empty\_bottles=1

Make the soda

Collect the empty glass bottles

Verify the bottles for shape and quality

Verify the soda filled bottles

Cap and label the filled bottles

Verify the completely final product

**Throw into Trash/Recycle**

Fill the soda into the empty bottles

Pack and ship the bottles

Verilog

verification=1 bottle\_verify=1

verification=0 bottle\_verify=1 trash=1

Packing=0

**trash=1**

**empty\_bottles=0 trash=0**

verification=0 bottle\_verify=1 trash=1

verification=0 bottle\_verify=1 trash=1 verification=0 bottle\_verify=1



Packing=1 empty\_bottles=0

Cap=0

Soda\_fill=0

Soda\_fill=1

verification=1 bottle\_verify=1

Cap=1

Verification=1

verification=1 bottle\_verify=1 packing=0

Soda=1

Bottle\_verify=0

Bottle\_verify=0

module SodaMachine(clk,reset, empty\_bottles, bottle\_verify, soda, soda\_filling, trash, verification, cap, packing);

input clk,reset,verification;

output reg empty\_bottles, soda, soda\_filling, trash, cap, packing;

//defining the states

parameter empty\_bottles = 4'b0000;

parameter bottle\_verify = 4'b0001;

parameter soda = 4'b0010;

parameter soda\_filling = 4'b0011;

parameter soda\_verification = 4'b0100;

parameter capping\_labeling = 4'b0101;

parameter final\_verification = 4'b0110;

parameter packing = 4'b0111;

parameter trash = 4'b1000;

reg[2:0] current state, next state;

always@(current\_state or empty\_bottles or soda)

begin

case(current\_state)

//in the first state the empty bottles are collected.

//if they are collected then bottles are sent to next state which is verification for size and shape

//else they are recycled and again re-collected

empty\_bottles:

if(empty\_bottles==0&&trash==0&&packing==1)

begin

next\_state=bottle\_verify;

empty\_bottles=1;

bottle\_verify=0;

trash=1;

packing=0;

end

else

begin

next\_state=current\_state;

empty\_bottles=0;

trash=0;

packing=1;

end

//in this state the empty bottles are verified for shape and size.

//if they are verified as okay then bottles are sent to next state which is soda filling state

//else they are sent into trash and are re-cycled

bottle\_verify:

if( empty\_bottles==1&&bottle\_verify==0&&verification=1)

begin

next\_state=soda\_filling;

bottle\_verify=1;

soda=1;

empty\_bottles=0;

end;

else

begin

next\_state=trash;

bottle\_verify=1;

soda=0;

empty\_bottles=1;

end

//in this state the soda is prepared.

//if soda is prepae it is sennt to next state which is soda filling state

//else it is refilled

soda:

if (soda==0)

begin

next\_state=soda\_filling;

soda==1;

end

else

begin

next\_state=current\_state;

soda=0;

end

//in this state the empty bottles are filled with soda

soda\_filling:

if(soda==1&&soda\_filling=0&&verification==1&&bottle\_verify==1)

begin

next\_state=soda\_verification;

soda=0;

bottle\_verify=0;

soda\_filling=1;

end

else

begin

next\_state=current\_state;

soda\_filling=0;

end

//in this state the soda bottles are verified for shape and size.

//if they are verified as okay then bottles are sent to next state which is capping and labeling

//else they are sent into trash and are re-cycled

soda\_verification:

if(soda\_filling==1&&bottle\_verify==0;verification==1)

begin

next\_state=capping\_labeling;

bottle\_verify=1;

soda\_filling=0;

cap=0;

end

else

begin

next\_state=trash;

bottle\_verify=1;

empty\_bottles=1;

//in this state the soda bottles are capped and labeled.

Capping\_labeling:

If(bottle\_verify==1&cap=0&verification==1)

Begin

Next state=final verification;

Cap=1;

Bottle\_verify=0;

End

Else

Begin

Next\_state=capping labeling

Cap=0;

Bottle\_verify=1;

Verification=1;

End

//in this state the last and final verification is done.

//if they are verified as okay then bottles are sent to next state which is packing

//else they are sent into trash and are re-cycled

Final\_verification:

If(cap==1&bottle\_verfiy==0&verification==1)

Begin

Next state=packing;

Bottle\_verify=1;

cap=0;

packing=0;

End

Else

Begin

Next\_state=trash;

Cap=0;

Bottle\_verify=1;

End

//in this state the bottles are packed

Packing:

If(bottle\_verify==1&packing=0&verification==1)

Begin

Next state= empty\_bottles;

packing=1;

Bottle\_verify=0;

Empty\_bottles=0;

Trash=0;

End

Else

Begin

Next\_state=packing;

packing=0;

Bottle\_verify=1;

End

//in this state the failed bottles are recycled and sent into the first state.

Trash:

If(verification==0&&bottle\_verify==1&&trash=1)

Begin

Next\_state= empty bottles;

Trash=0;

Bottle\_verify=0;

End

Else

Begin

Next state=trash;

Trash=1;

Packing=0;

Bottle\_verify=1;

end