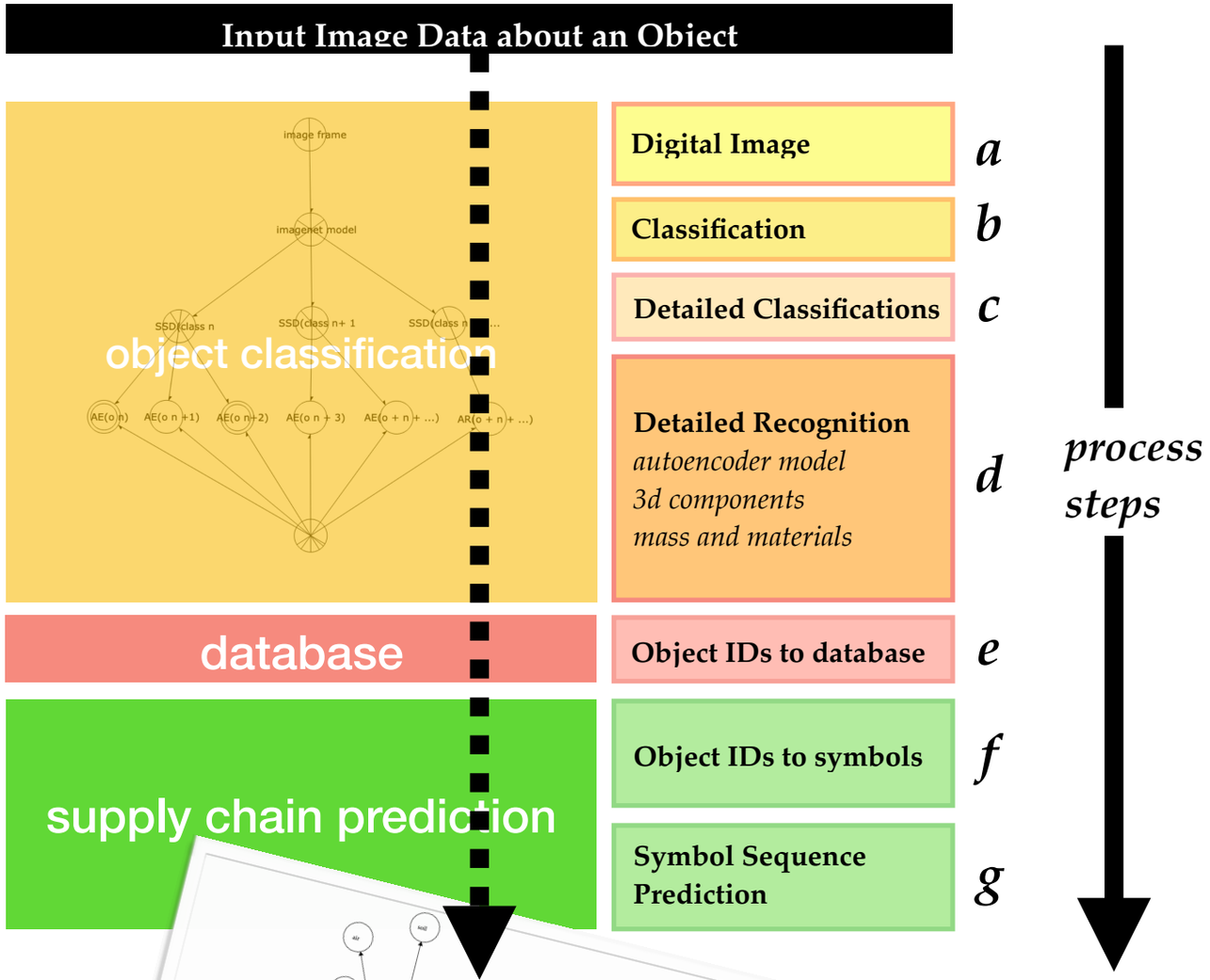
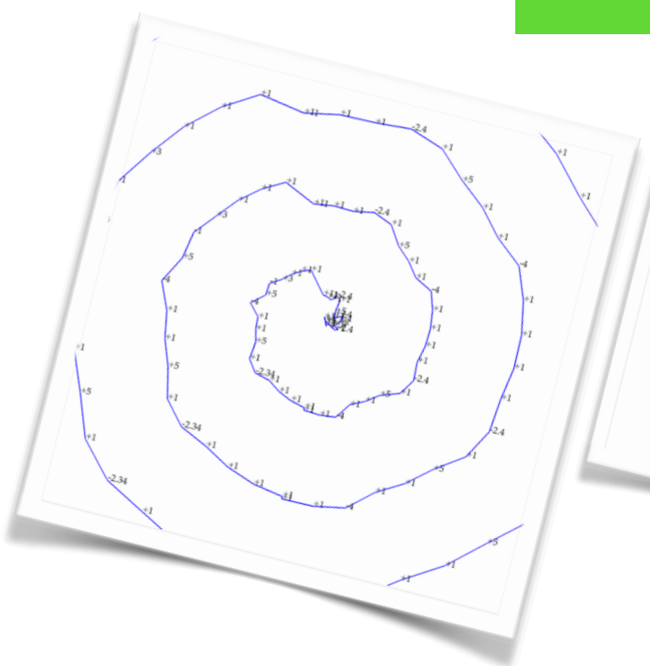
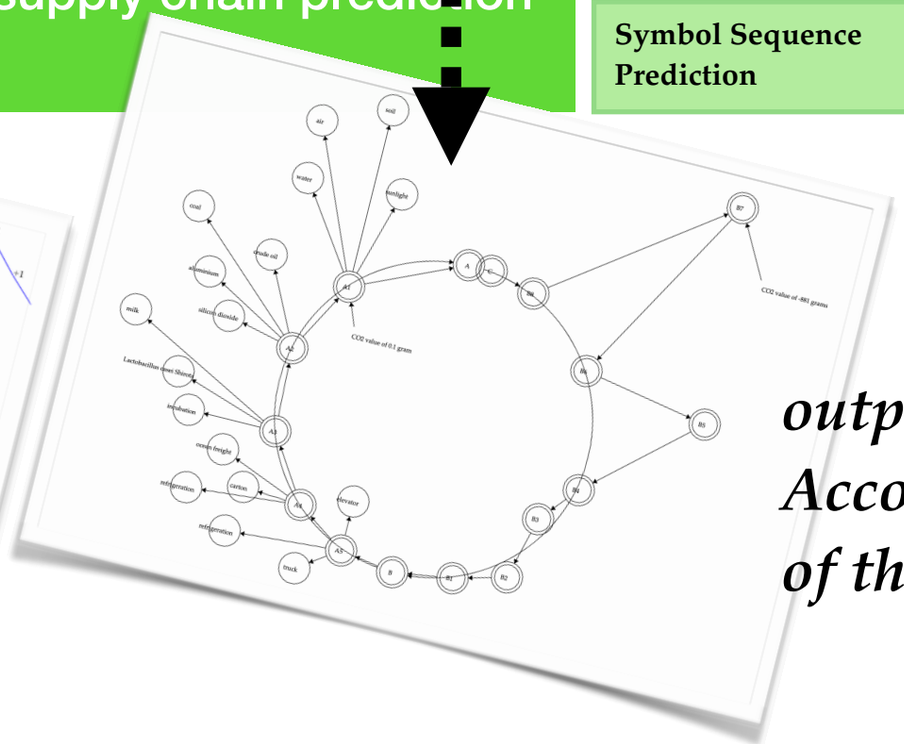
# Overview concepts of data input for building CO2 sequestration networks and vectors

## 20210910WA_ data_input_CVM_network and vectors

# 202108 Current Version

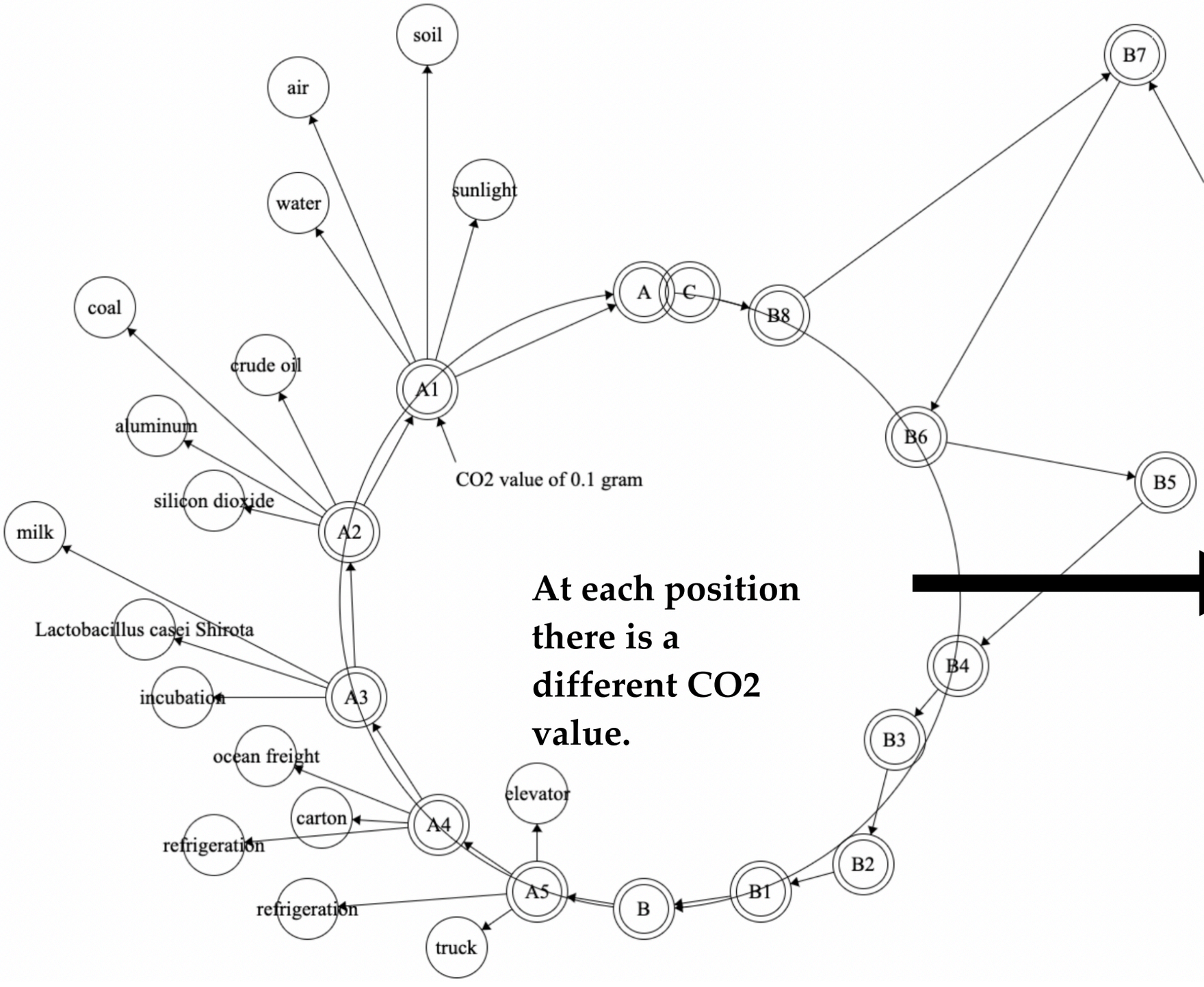


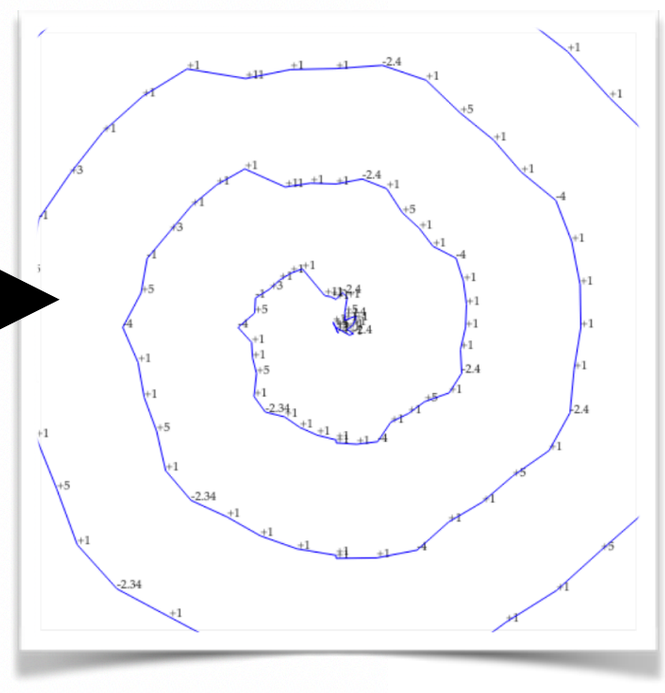


*output: a Circularity Accounting Model of the object*

**The simplified version of the graph is what we are using as the '*circularity economy*' diagram, which shows the carbon values as distances from a circle.**



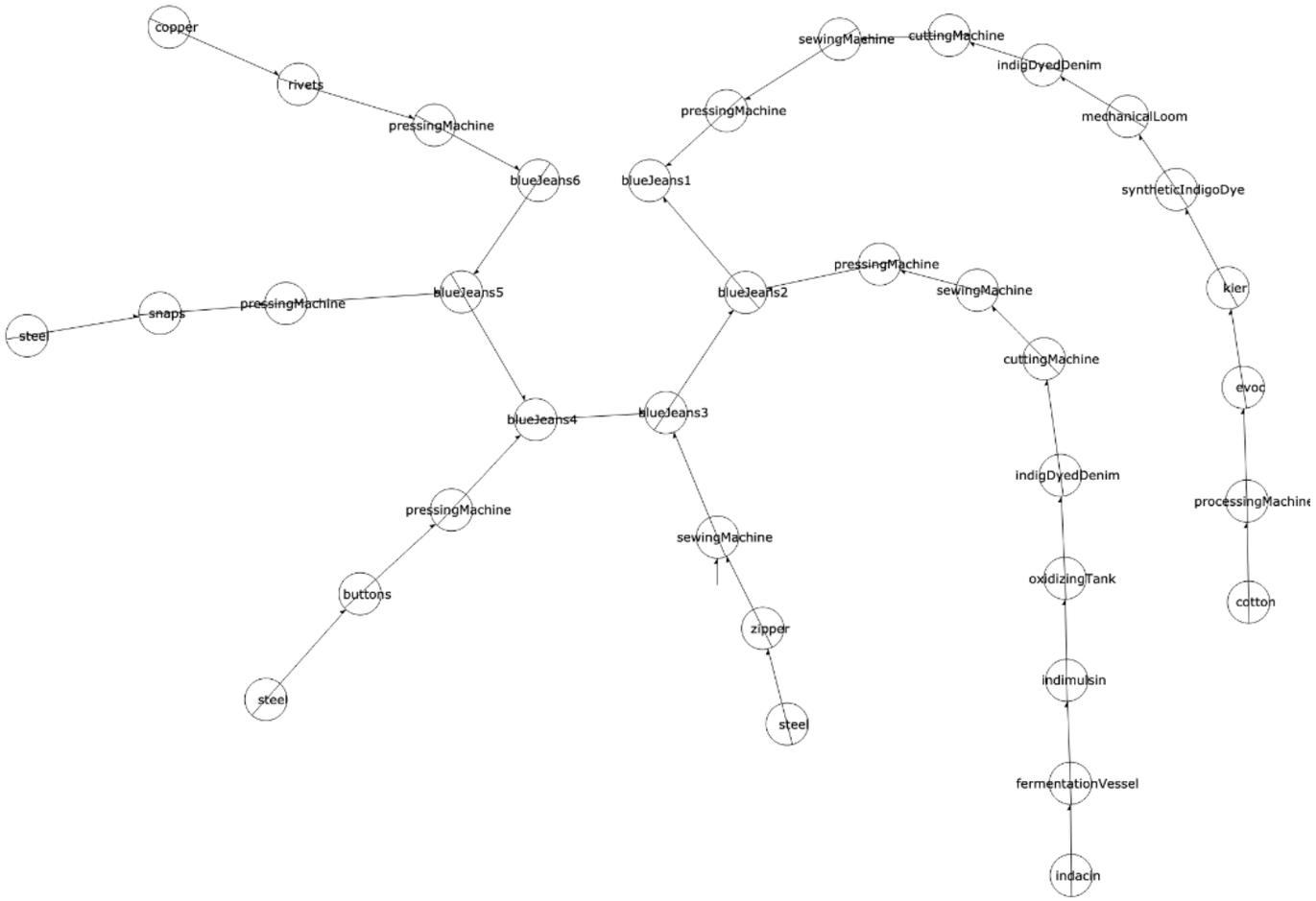

**At each position there is a different CO2 value.**



**after 4 cycles**

**requires data that describes the supply chain and the disposal chain**

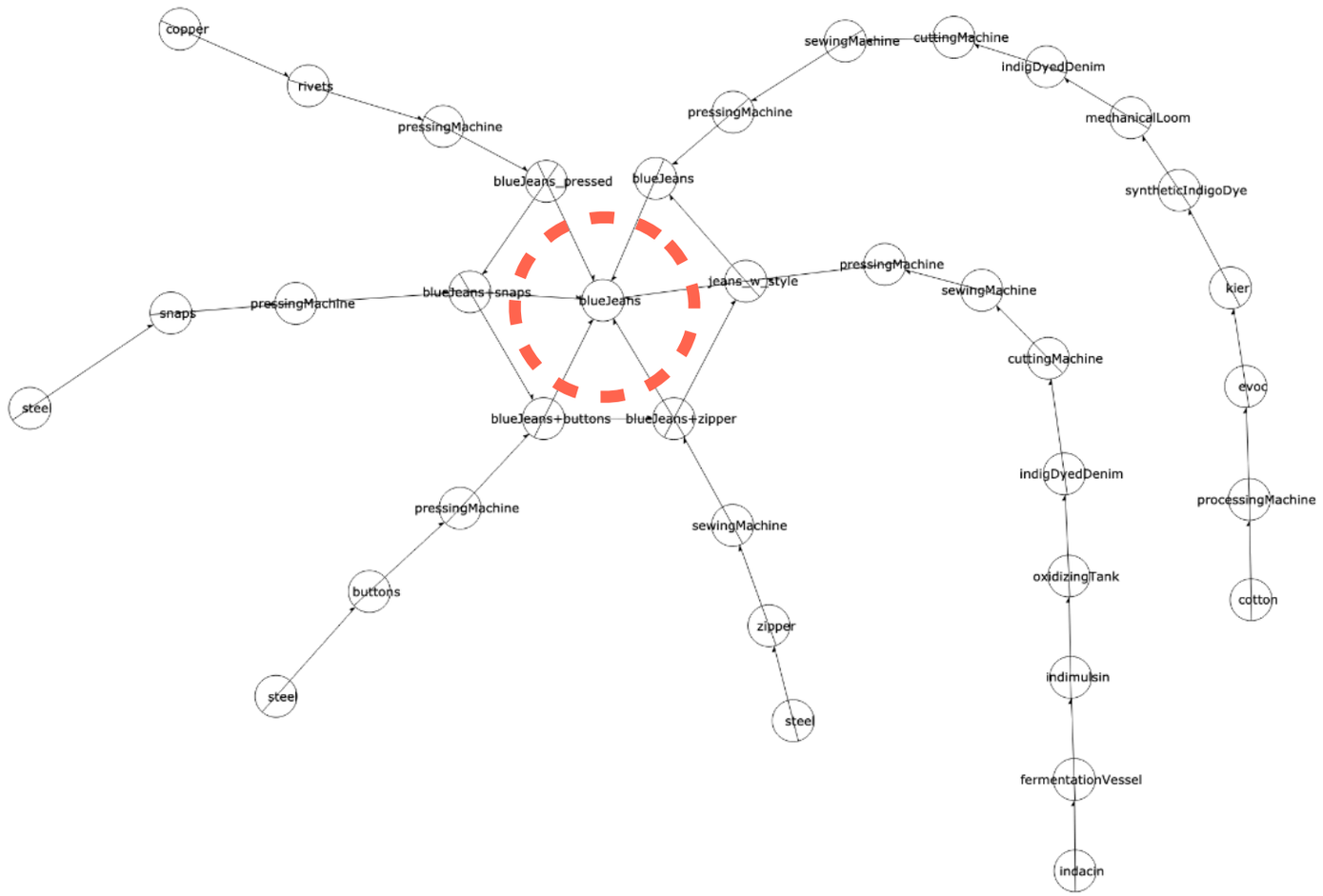
how to conceptualize and encode the steps in a supply-destruction chain model




**From the consumption vectors, we can make this graph,**

**which shows the inputs of carbon on the production ‘circle’ of blueJeans.**

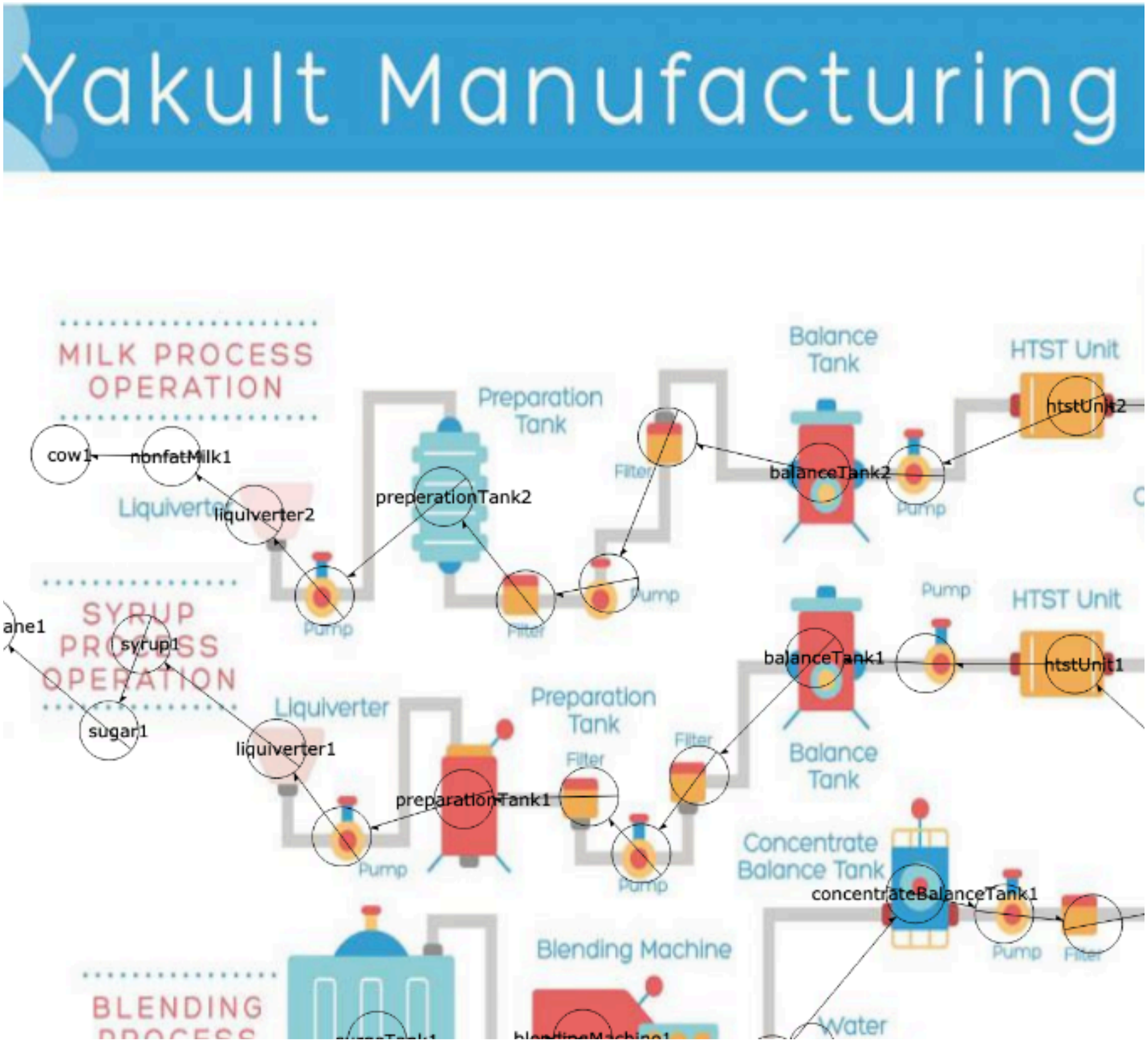
**The circle is the the beginning to the end of the blueJeans product.**




**Note the addition of the center node, and the requirement to sum all the component vectors.**

**We can make a realistic graph, from the inputs of carbon on the production network of Yakult.**

***This network is not circular.***



SYRUP PROCESS OPERATION

BLENDING PROCESS OPERATION

BOTTLING PROCESS OPERATION

syrup1

sugar1

liquiverter1

Liquiverter

Pump

preparationTank1

Preparation Tank

Filter

Pump

Filter

balanceTank1

Balance Tank

Pump

htstUnit1

HTST Unit

Filter

Pump

storageTank1

Storage Tank

concentrateBalanceTank1

Concentrate Balance Tank

Pump

Filter

surgeTank1

Surge Tank

blendingMachine1

Blending Machine

waterBalanceTank1

Water Balance Tank

UV

PC

Pump

Water Tank

waterTank1

Filter

Pump

fillerMachine1

Filler Machine

cappingSealingMachine1

Capping/Sealing Machine

shrinkPackagingMachine1

Packaging Machine

reshrinkPackagingMachine1

Re-shrink Packaging Machine

printerLabelerMachine1

Printer/ Labeler Machine

ink1

bottleSelector1

Bottle Selector

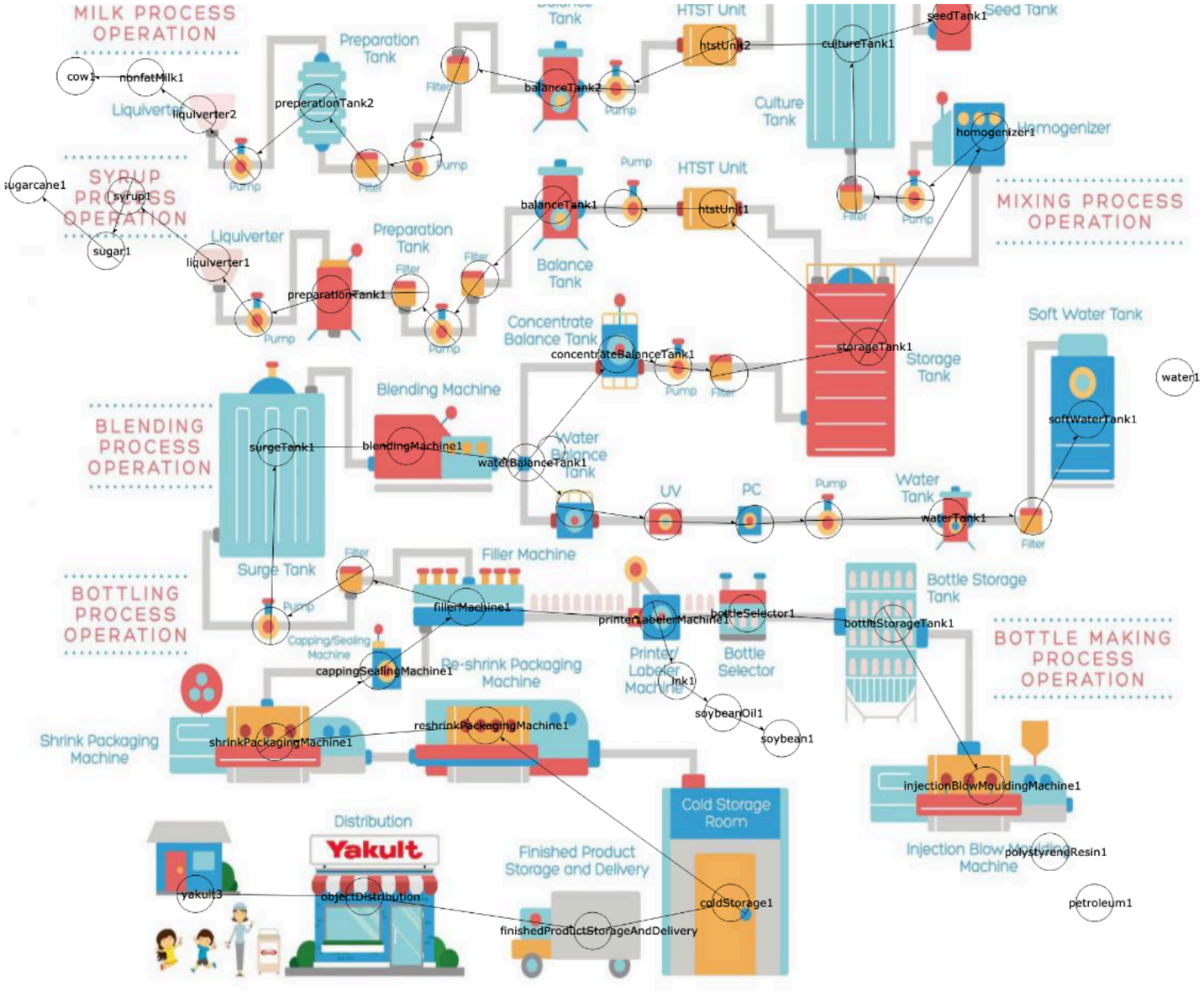
soybeanOil1

soybean1

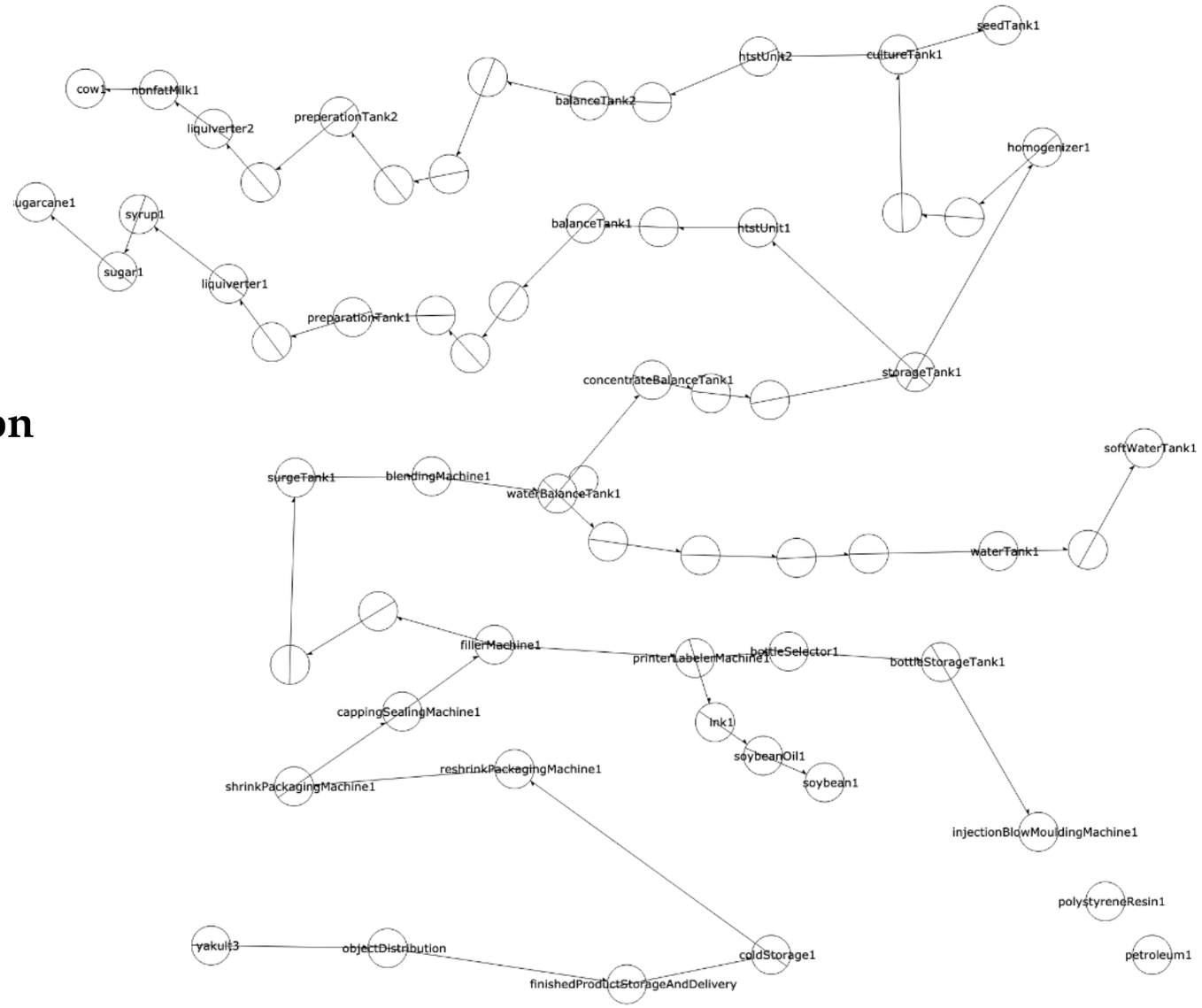
bottleStorageTank1

Bottle Tank

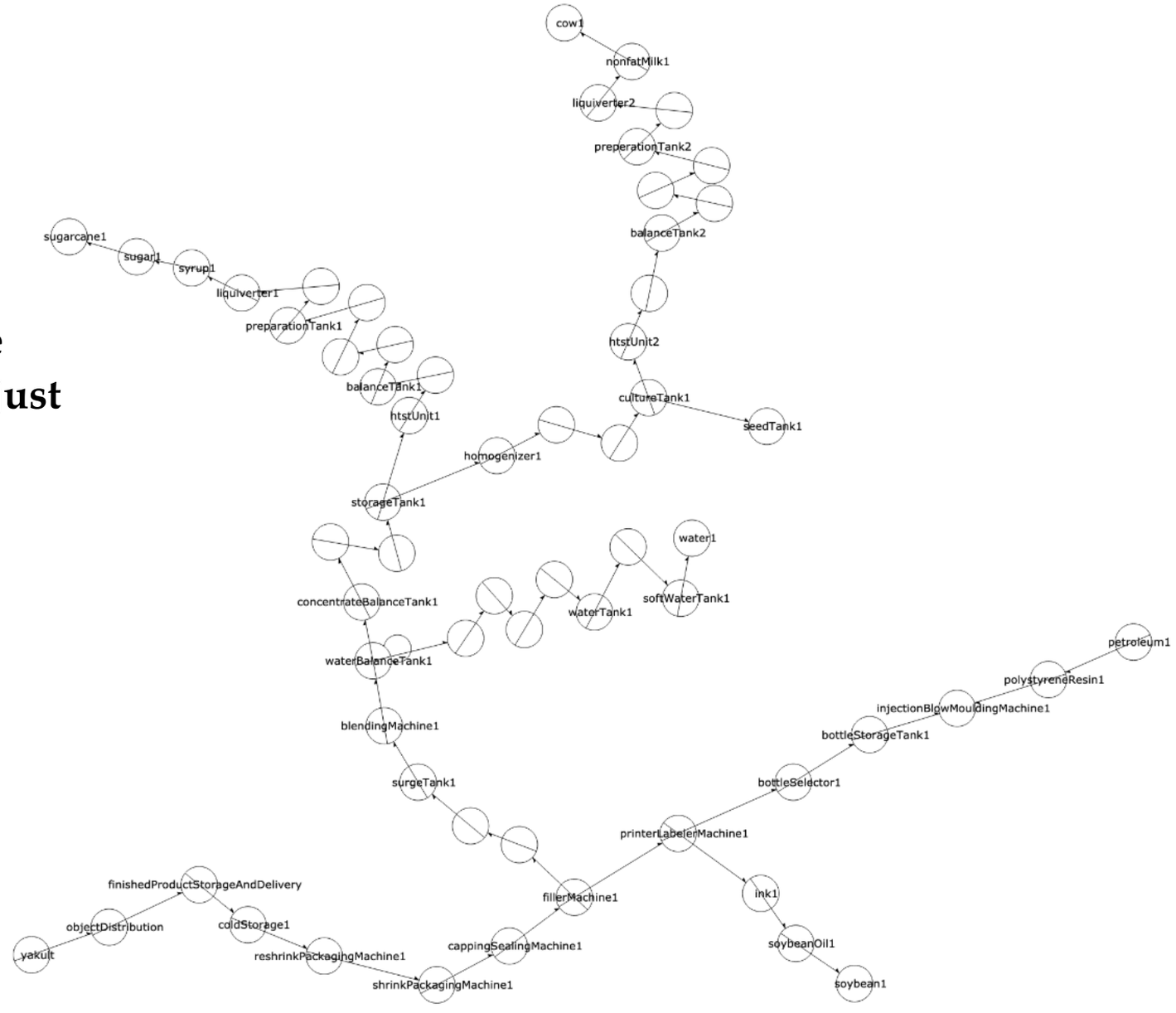
injectionBlo


MILK PROCESS OPERATION
cow1
nonfatMilk1
Liquiverter
liquiverter2
Pump
preperationTank2
Preparation Tank
Filter
Filter
Pump
Tank
balanceTank2
Pump
HTST Unit
htstUnit2
Culture Tank
cultureTank1
seedTank1
Seed Tank
Homogenizer
homogenizer1
SYRUP PROCESS OPERATION
sugarcane1
syrup1
sugar1
Liquiverter
liquiverter1
Pump
preparationTank1
Preparation Tank
Filter
Filter
Pump
balanceTank1
Pump
Balance Tank
HTST Unit
htstUnit1
Filter
Pump
MIXING PROCESS OPERATION
Concentrate Balance Tank
concentrateBalanceTank1
Pump
Filter
storageTank1
Storage Tank
Soft Water Tank
softWaterTank1
water1
BLENDING PROCESS OPERATION
surgeTank1
Blending Machine
blendingMachine1
waterBalanceTank1
Water Balance Tank
UV
PC
Pump
Water Tank
waterTank1
Filter
Surge Tank
Filter
Pump
Filler Machine
fillerMachine1
BOTTLING PROCESS OPERATION
Capping/Sealing Machine
cappingSealingMachine1
Re-shrink Packaging Machine
reshrinkPackagingMachine1
Shrink Packaging Machine
shrinkPackagingMachine1
printerLabelerMachine1
Printer/ Labeler Machine
bottleSelector1
Bottle Selector
Bottle Storage Tank
bottleStorageTank1
BOTTLE MAKING PROCESS OPERATION
ink1
soybeanOil1
soybean1
injectionBlowMouldingMachine1
Injection Blow Moulding Machine
polystyrengResin1
petroleum1
Distribution
Yakult
yakult3
objectDistribution
Finished Product Storage and Delivery
finishedProductStorageAndDelivery
Cold Storage Room
coldStorage1

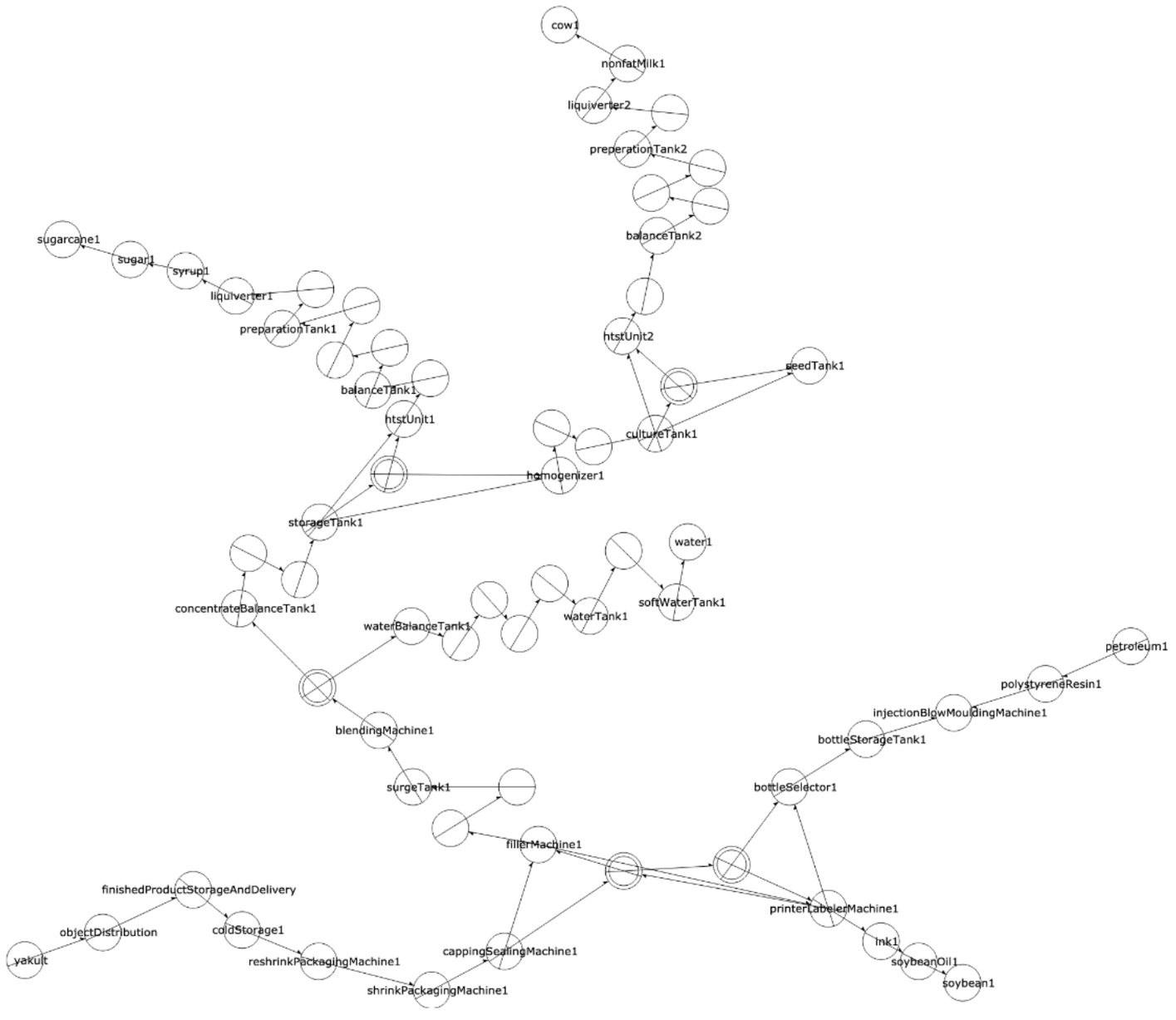
**Realistic production network of Yakult.**



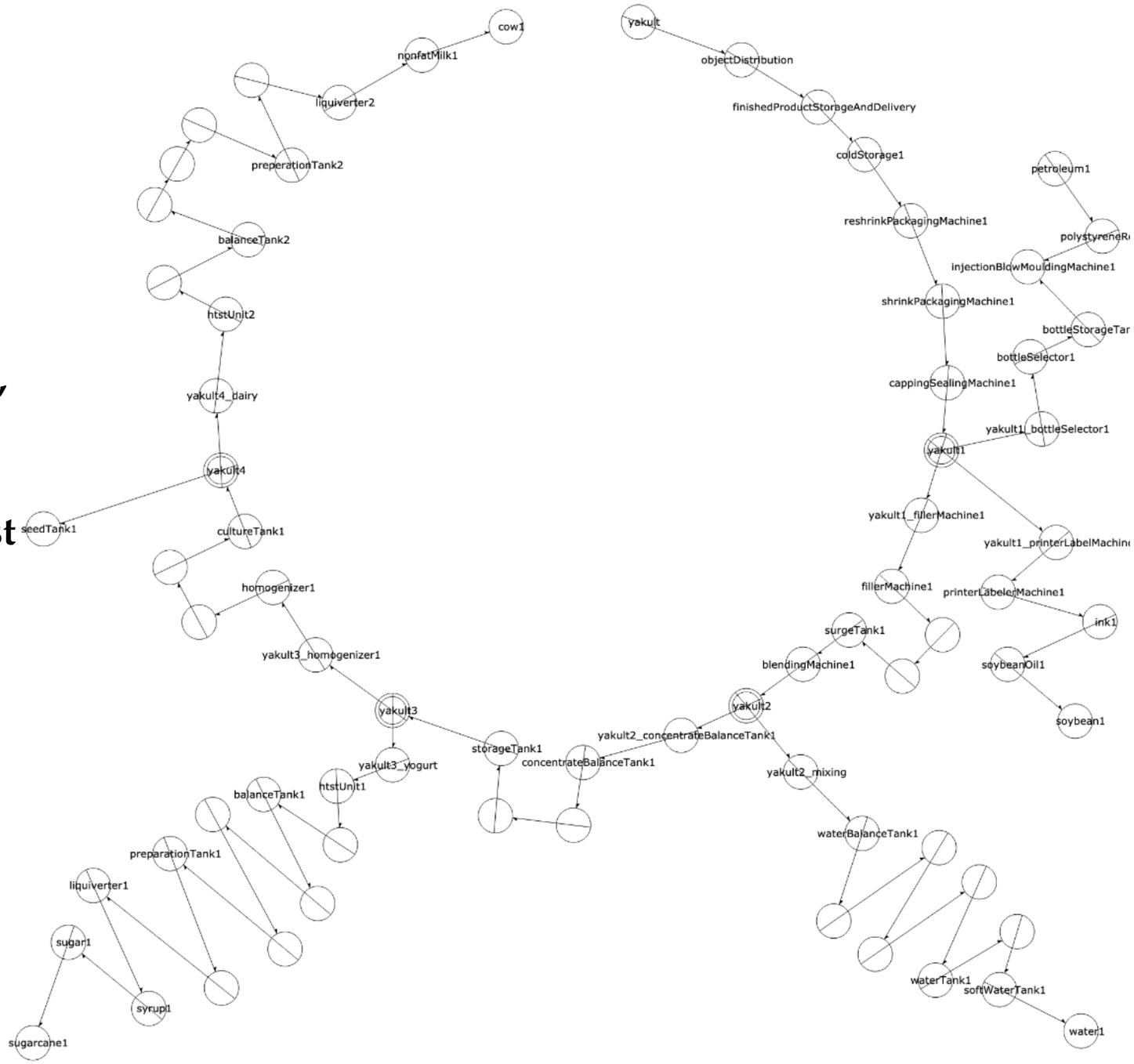
**Re-flow the graph, the links are unchanged, just visual difference.**



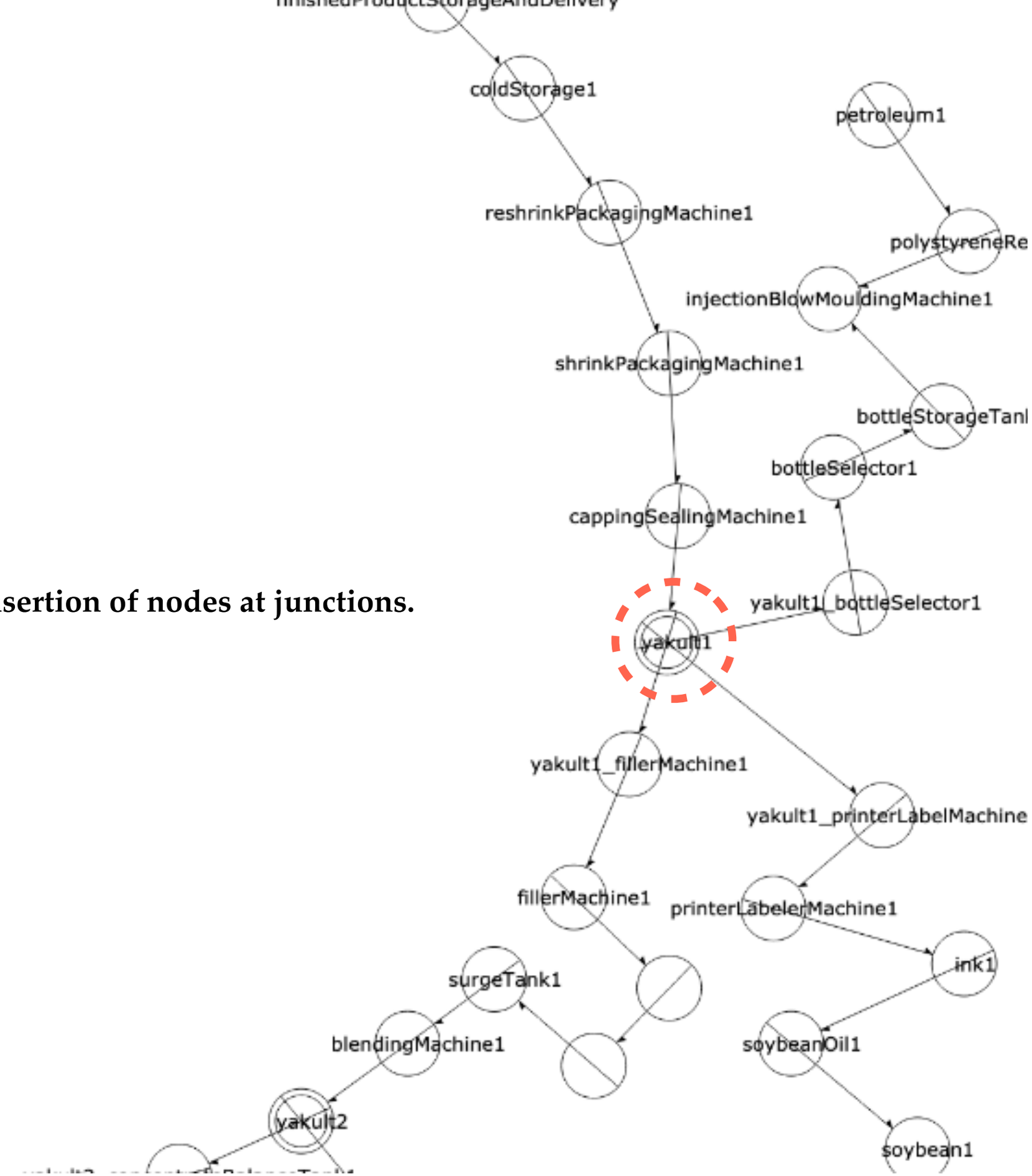
**Insert new nodes at junctions in the chain.**



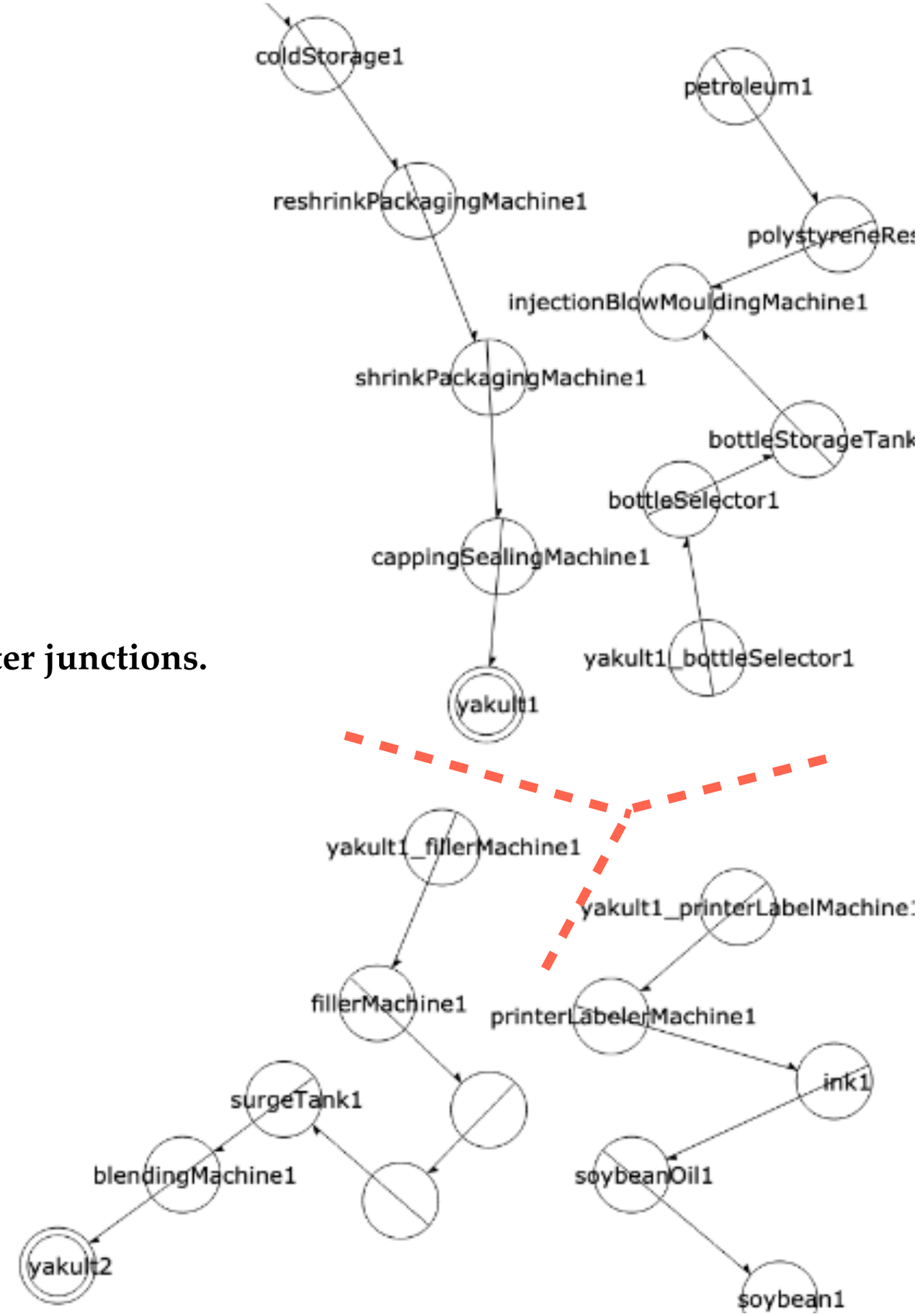
**Re-flow the graph again, the links are unchanged (with the addition of nodes for junctions), just visual difference.**

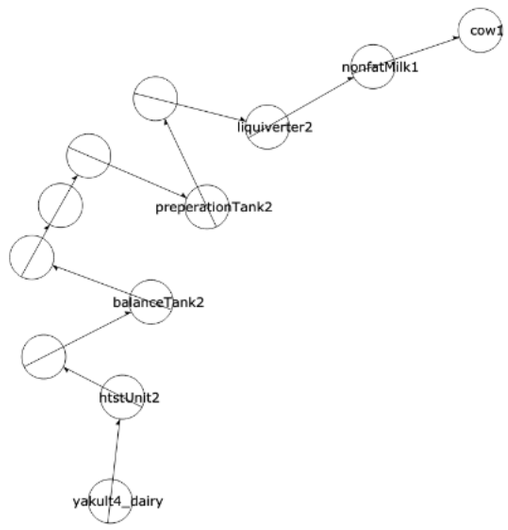


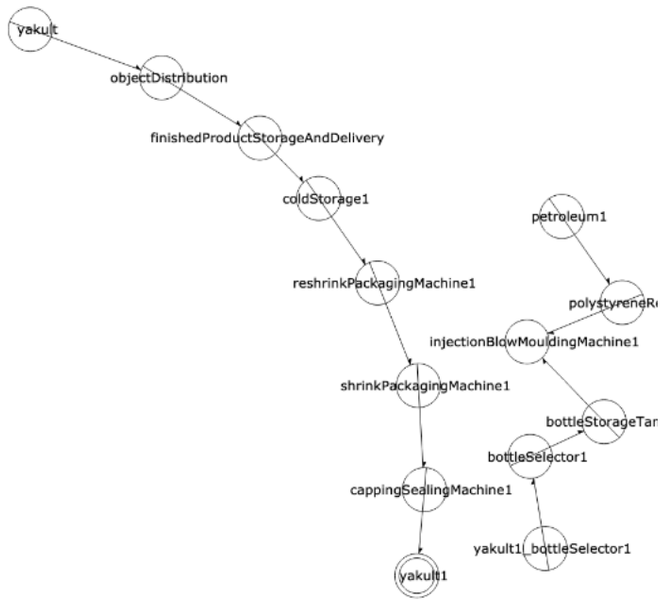
**Note the insertion of nodes at junctions.**



**Note the deletion of links after junctions.**



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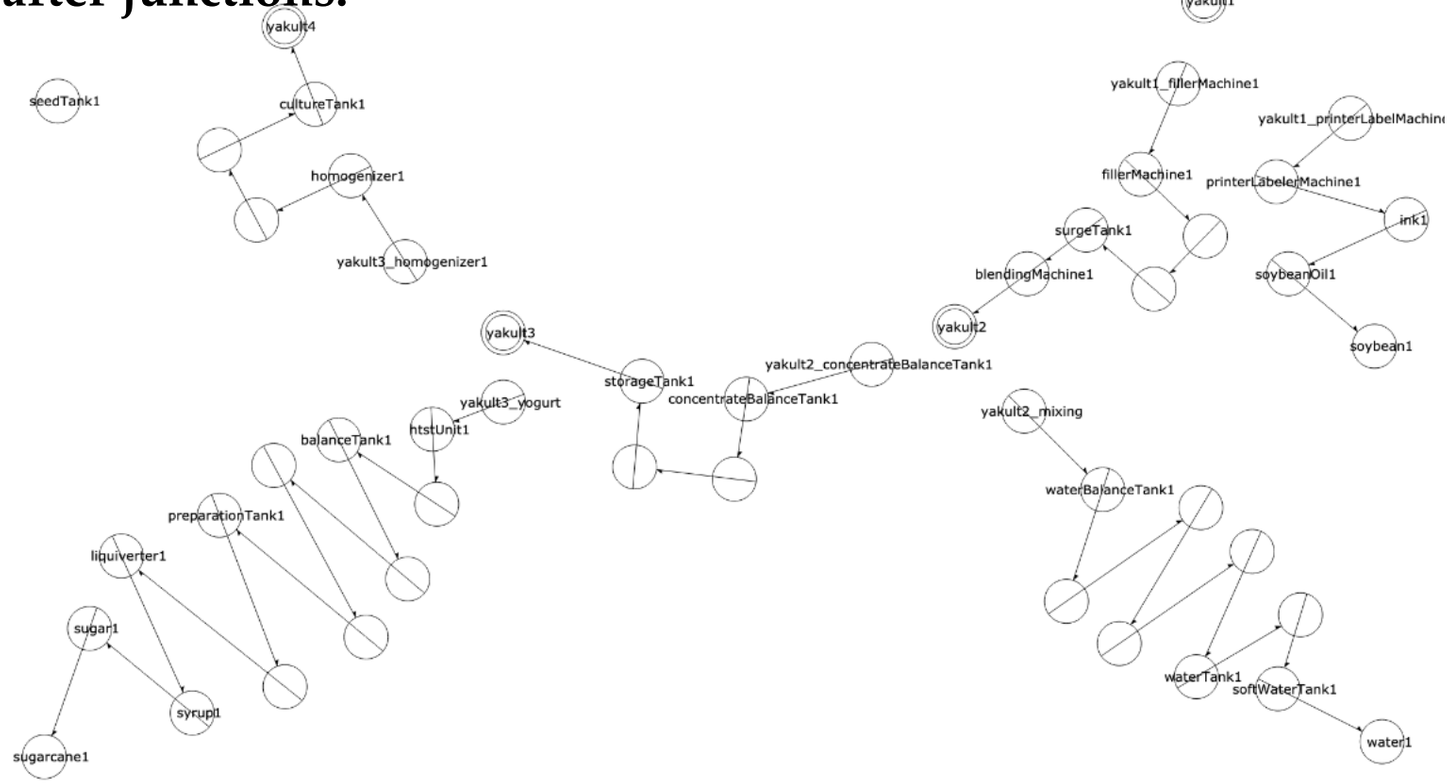
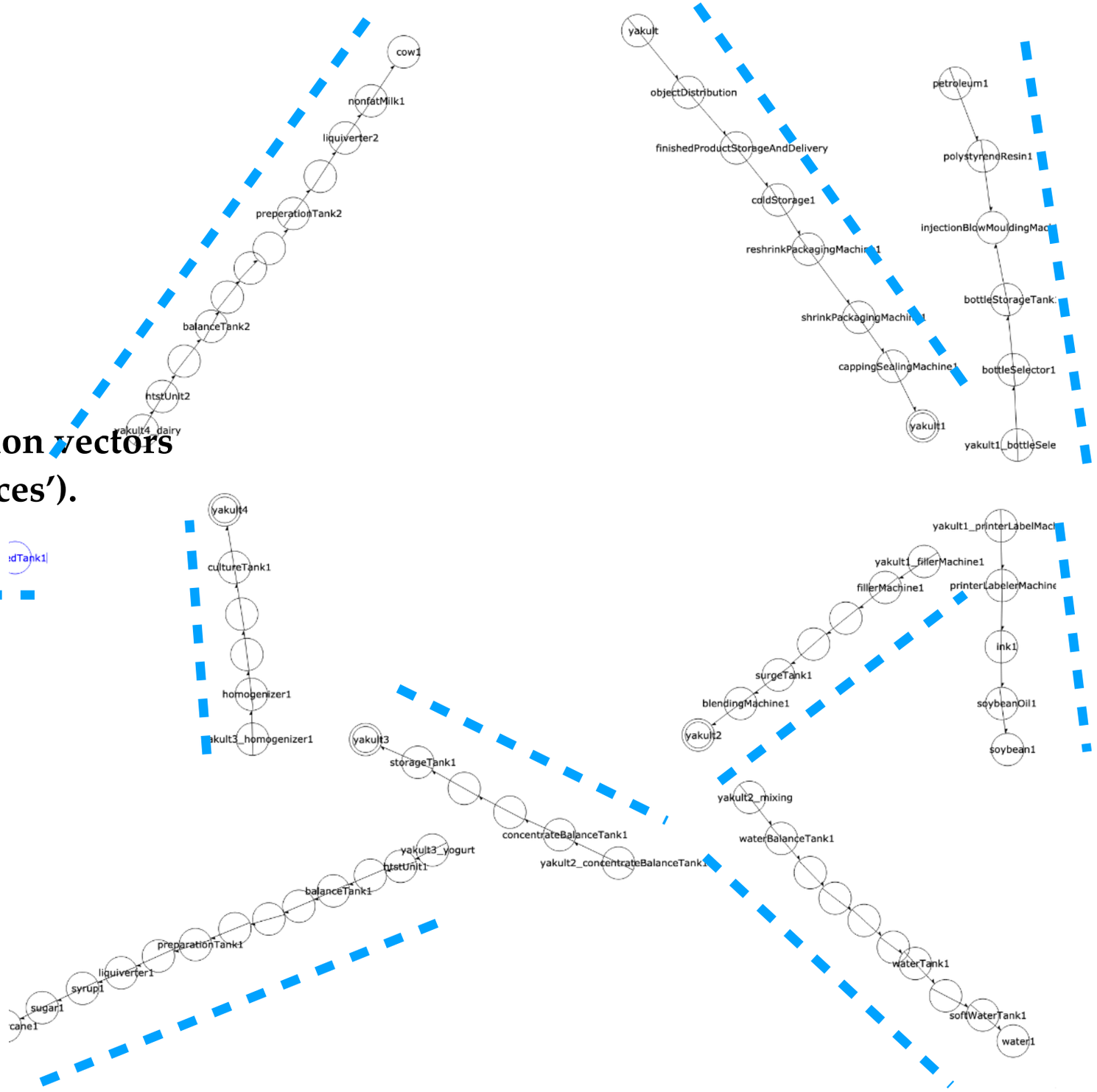
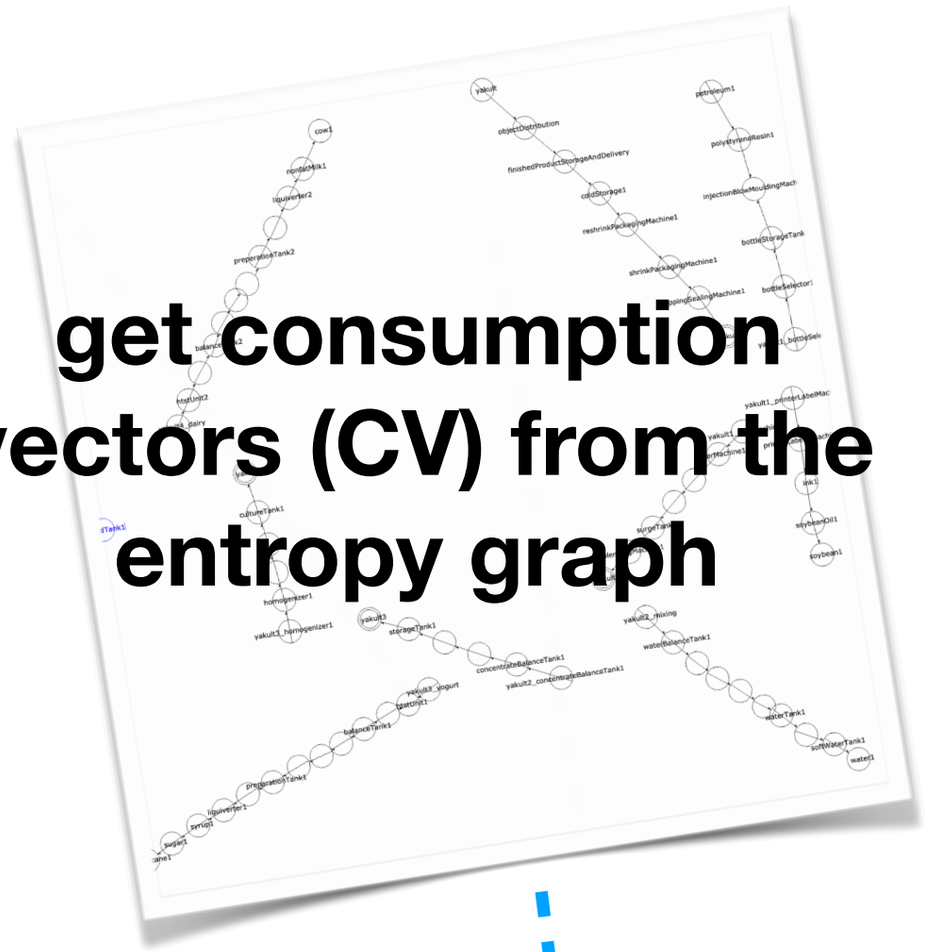


**Segmentation of consumption vectors into smaller pieces (‘sentences’).**



# get consumption vectors (CV) from the entropy graph

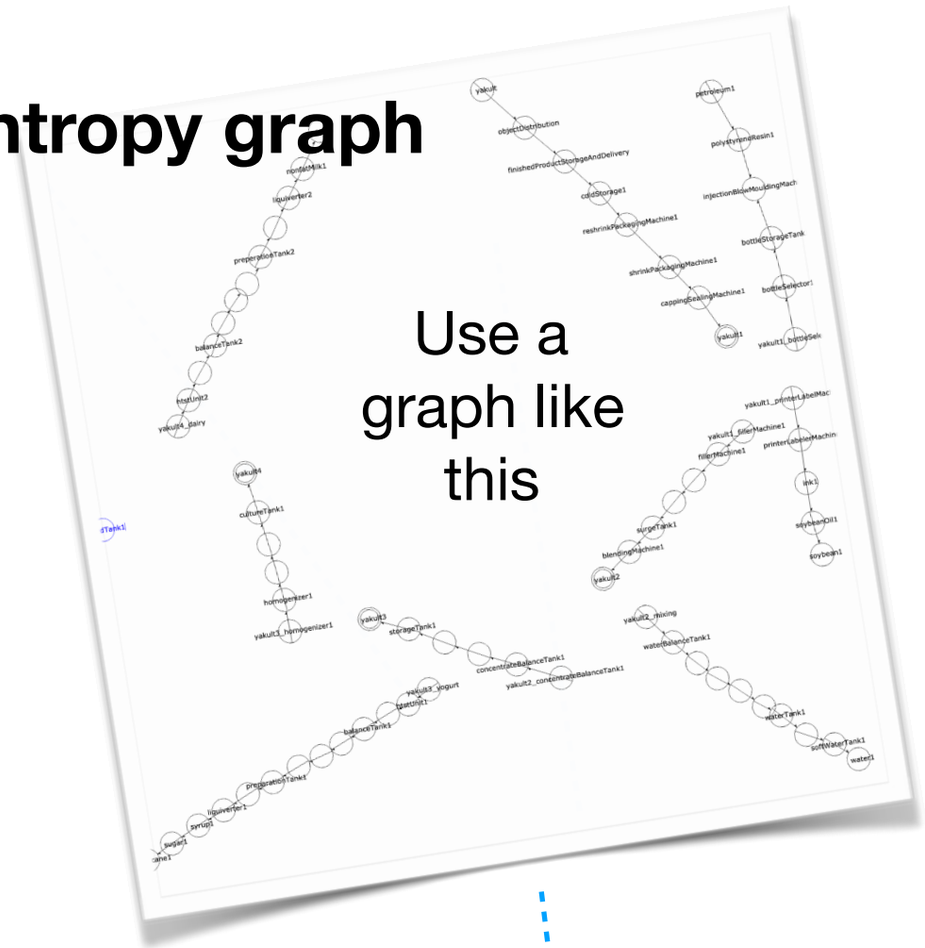


**How To:**

# Get consumption vectors (CV) from the entropy graph

Use this tool:

http://www.entropynetwork.com/doc2/?jsonURL=%2Fpub%2Fdata%2Feco2%2F20210910023129-jesse-yakult-CVM-diverge6-segment2-diagram.json&xres=2048&yres=2048&imageURL=



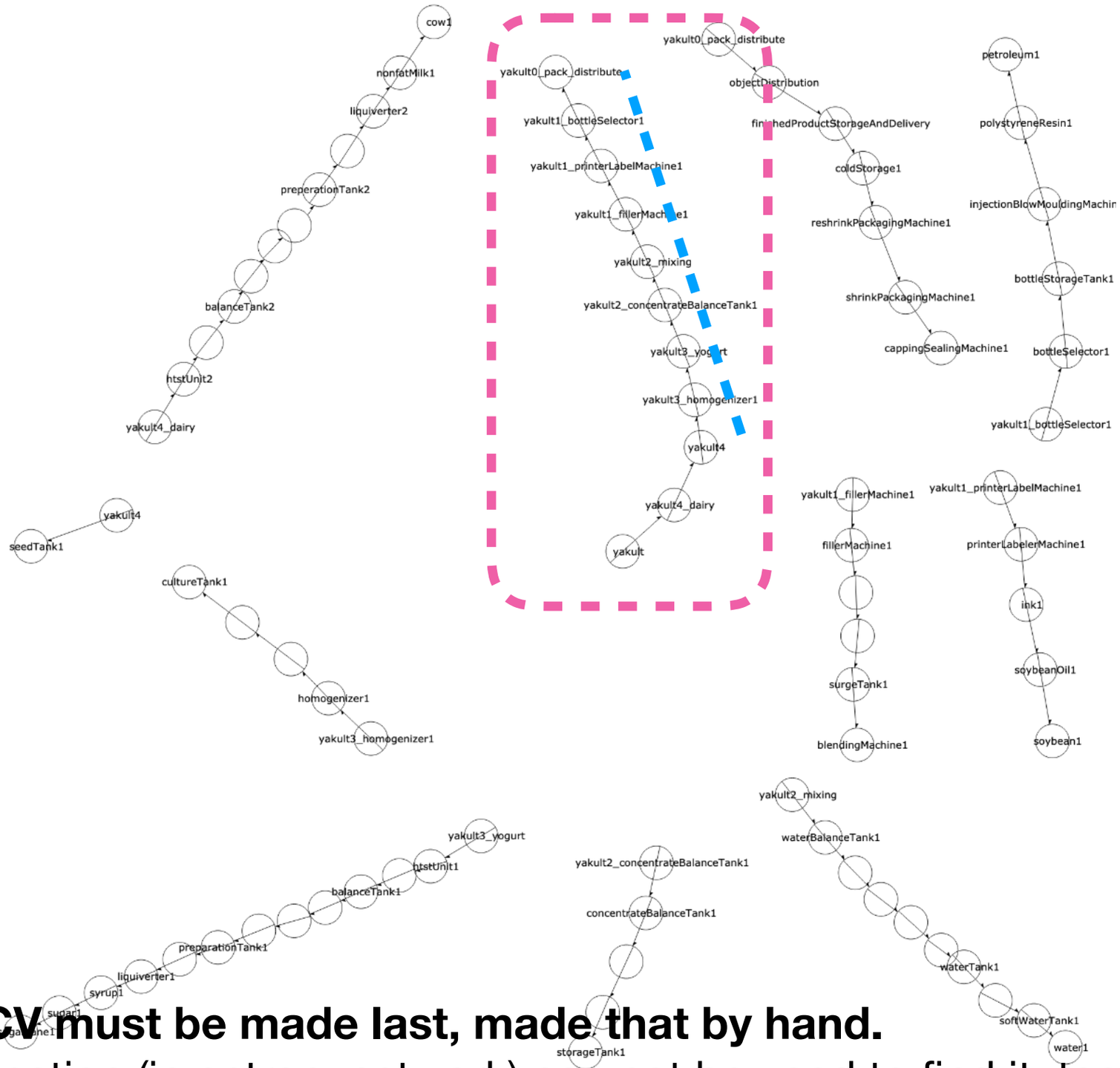

1] Click the observer node that observes the chain (CV).
2] Now click "findVector" button that appears near the "Set Text" box.

3] The text of the vector as a sentence will appear in the output box.

4] The top level CV must be made last, make that by hand.

The findVector function can not be used to find it because the names are all duplicates.

**Add top vector.**




**This ‘top level’ CV must be made last, made that by hand.**

The findVector function (in entropynetwork) can not be used to find it, technically because the names are all duplicates.

water1 softWaterTank1 waterTank1 waterBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

sugarcane1 sugar1 syrup1 liquiverter1 preparationTank1 balanceTank1 htstUnit1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

lactobacillus seedTank1 cultureTank1 homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

cow1 nonfatMilk1 liquiverter2 preperationTank2 balanceTank2 htstUnit2 cultureTank1 homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

naturalflavors homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

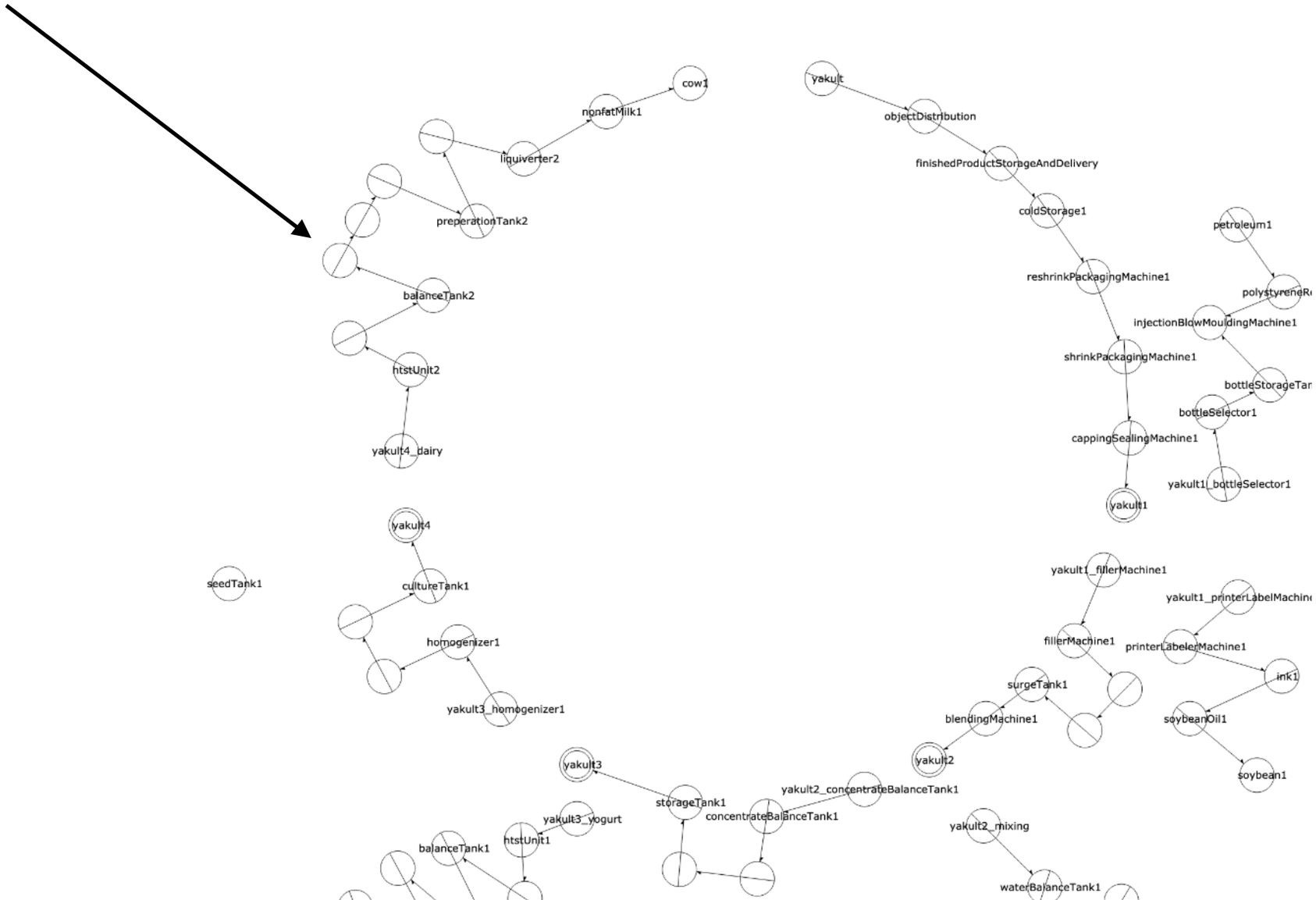
petroleum1 polystyreneResin1 injectionBlowMouldingMachine1 bottleStorageTank1 bottleSelector1 printerLabelerMachine1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

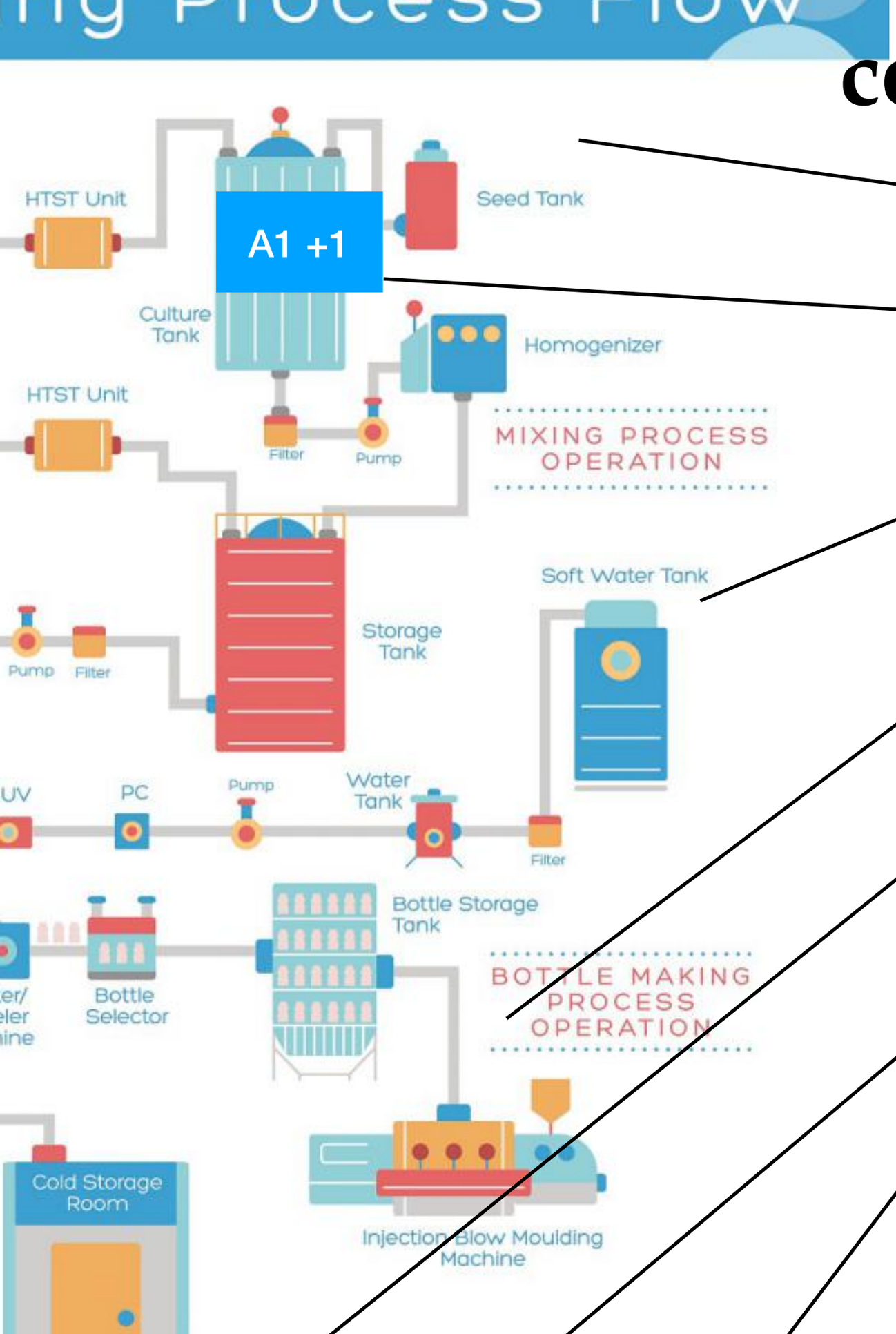
soybean1 soybeanOil1 ink1 printerLabelerMachine1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

**From the consumption vectors, we can make this graph,**

**which shows the inputs of carbon on the production ‘circle’ of Yakult.**

**The circle is the the beginning to the end of the Yakult product.**






# consumption vectors

water1 softWaterTank1 waterTank1 waterBalanceTank1 blen
cappingSealingMachine1 shrinkPackagingMachine1 reshrin
yakult1

~~sugarcane1 sugar1~~ syrup1 liquiverter1 preparationTank1 bal
concentrateBalanceTank1 blendingMachine1 ~~surgeTank~~1 filt
shrinkPackagingMachine1 reshrinkPackagingMachine1 cold

lactobacillus seedTank1 cultureTank1 homogenizer1 storage
blendingMachine1 surgeTank1 filterMachine1 cappingSealin
reshrinkPackagingMachine1 coldStorage1 yakult1

cow1 nonfatMilk1 liquiverter2 preperationTank2 balanceTank
storageTank1 concentrateBalanceTank1 blendingMachine1
cappingSealingMachine1 shrinkPackagingMachine1 reshrin
yakult1

naturalflavors homogenizer1 storageTank1 concentrateBala
filterMachine1 cappingSealingMachine1 shrinkPackagingMa
coldStorage1 yakult1

petroleum1 polystyreneResin1 injectionBlowMouldingMachi
printerLabelerMachine1 filterMachine1 cappingSealingMach
reshrinkPackagingMachine1 coldStorage1 yakult1

soybean1 soybeanOil1 ink1 printerLabelerMachine1 filterMa
shrinkPackagingMachine1 reshrinkPackagingMachine1 cold

water1 softWaterTank1 waterTank1 waterBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

sugarcane1 sugar1 syrup1 liquiverter1 preparationTank1 balanceTank1 htstUnit1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

lactobacillus seedTank1 cultureTank1 homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

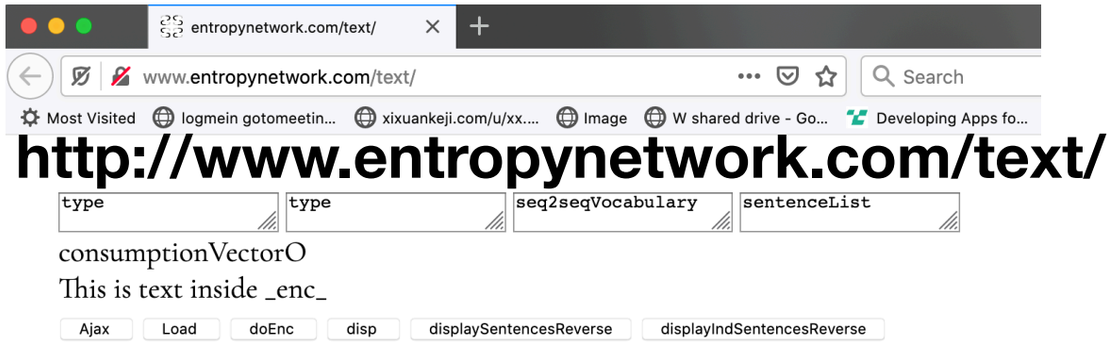
cow1 nonfatMilk1 liquiverter2 preperationTank2 balanceTank2 htstUnit2 cultureTank1 homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

naturalflavors homogenizer1 storageTank1 concentrateBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

petroleum1 polystyreneResin1 injectionBlowMouldingMachine1 bottleStorageTank1 bottleSelector1 printerLabelerMachine1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

soybean1 soybeanOil1 ink1 printerLabelerMachine1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1

water1 softWaterTank1 waterTank1 waterBalanceTank1 blendingMachine1 surgeTank1 filterMachine1 cappingSealingMachine1 shrinkPackagingMachine1 reshrinkPackagingMachine1 coldStorage1 yakult1




```
shrinkPackagingMachine1
reshrinkPackagingMachine
1 coldStorage1 yakult1

petroleum1
polystyreneResin1
injectionBlowMouldingMac
hine1 bottleStorageTank1
bottleSelector1
printerLabelerMachine1
filterMachine1
cappingSealingMachine1
shrinkPackagingMachine1
reshrinkPackagingMachine
1 coldStorage1 yakult1

soybean1 soybeanOil1
ink1
printerLabelerMachine1
filterMachine1
cappingSealingMachine1
shrinkPackagingMachine1
reshrinkPackagingMachine
1 coldStorage1 yakult1
```

```
["water1|0","softwatertank1|1",
"watertank1|2","waterbalancetan
k1|3","blendingmachine1|4","sur
getank1|5","filtermachine1|6","
cappingsealingmachine1|7","shri
nkpackagingmachine1|8","reshrin
kpackagingmachine1|9","coldstor
age1|10","yakult1|11","sugarcan
e1|12","sugar1|13","syrup1|14",
"liquiverter1|15","preparationt
ank1|16","balancetank1|17","hts
tunit1|18","storagetank1|19","c
oncentratebalancetank1|20","lac
tobacillus|21","seedtank1|22","
culturetank1|23","homogenizer1|
24","cow1|25","nonfatmilk1|26",
"liquiverter2|27","preperationt
ank2|28","balancetank2|29","hts
tunit2|30","naturalflavors|31",
"petroleum1|32","polystyreneres
in1|33","injectionblowmouldingm
achine1|34","bottlestoragetank1
|35","bottleselector1|36","prin
terlabelermachine1|37","soybean
```

```
water1  0
softwatertank1  1
watertank1      2
waterbalancetank1       3
blendingmachine1        4
surgetank1      5
filtermachine1  6
cappingsealingmachine1  7
shrinkpackagingmachine1 8
reshrinkpackagingmachine1
        9
coldstorage1    10
yakult1 11
sugarcane1      12
sugar1  13
syrup1  14
liquiverter1    15
preparationtank1        16
balancetank1    17
htstunit1       18
storagetank1    19
concentratebalancetank1 20
lactobacillus   21
seedtank1       22
```

```
water1 softwatertank1
watertank1 waterbalancetank1
blendingmachine1 surgetank1
filtermachine1
cappingsealingmachine1
shrinkpackagingmachine1
reshrinkpackagingmachine1
coldstorage1 yakult1.
sugarcane1 sugar1 syrup1
liquiverter1
preparationtank1
balancetank1 htstunit1
storagetank1
concentratebalancetank1
blendingmachine1 surgetank1
filtermachine1
cappingsealingmachine1
shrinkpackagingmachine1
reshrinkpackagingmachine1
coldstorage1 yakult1.
lactobacillus seedtank1
culturetank1 homogenizer1
storagetank1
concentratebalancetank1
```

# Symbol is a label for an object.

## CO2 values

| | |
|---|---|
| **water1** | **1** |
| **softwatertank1** | 2 |
| **watertank1** | 23 |
| **waterbalancetank1** | 34 |
| **blendingmachine1** | 34 |
| **surgetank1** | ? |
| **filtermachine1** | ? |
| **cappingsealingmachine1** | ? |
| **shrinkpackagingmachine1** | ? |
| **reshrinkpackagingmachine1** | ? |
| **coldstorage1** | ? |
| **yakult1** | ? |
| **sugarcane1** | ? |
| **sugar1** | ? |
| **syrup1** | ? |
| **liquiverter1** | ? |
| **preparationtank1** | ? |
| **balancetank1** | ? |
| **htstunit1** | ? |
| **storagetank1** | ? |

# Naming: Machine + Protocol

20210909 Naming: Machine + Protocol

In production we may describe the actions of a machine, as in:
Machine + Protocol. In our model, instead of being domain restricted, we can use general terms, 'Object', and 'Behavior' of the object.

Object_Behavior
like this -
shrinkPackagingMachine1_StirFor37000ms

For non-machines, for example trees, Object_Behavior may be something like 'tree_grow', or for a human 'Person_DriveCar'.

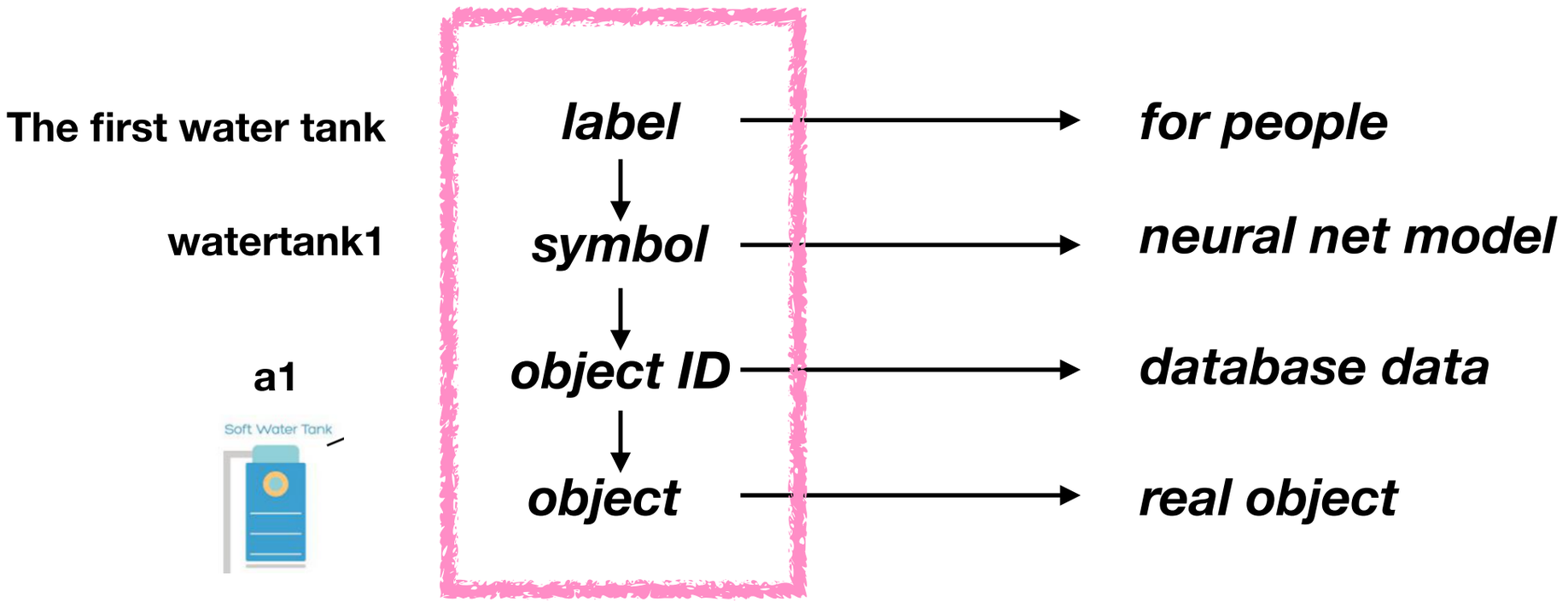
The Symbols which we use, that represent positions in the chain, can only have one CO2 value. If an object may have multiple CO2 values, it is necessary to create multiple symbols. For example,

Person_DriveCar1
Person_DriveCar2

**Symbol is a label for an object, and the label for several models of that object**

**There are infinite objects, models, and symbols.**

a1
b2
b1
b4
a33
b78
...




*same use, different systems*

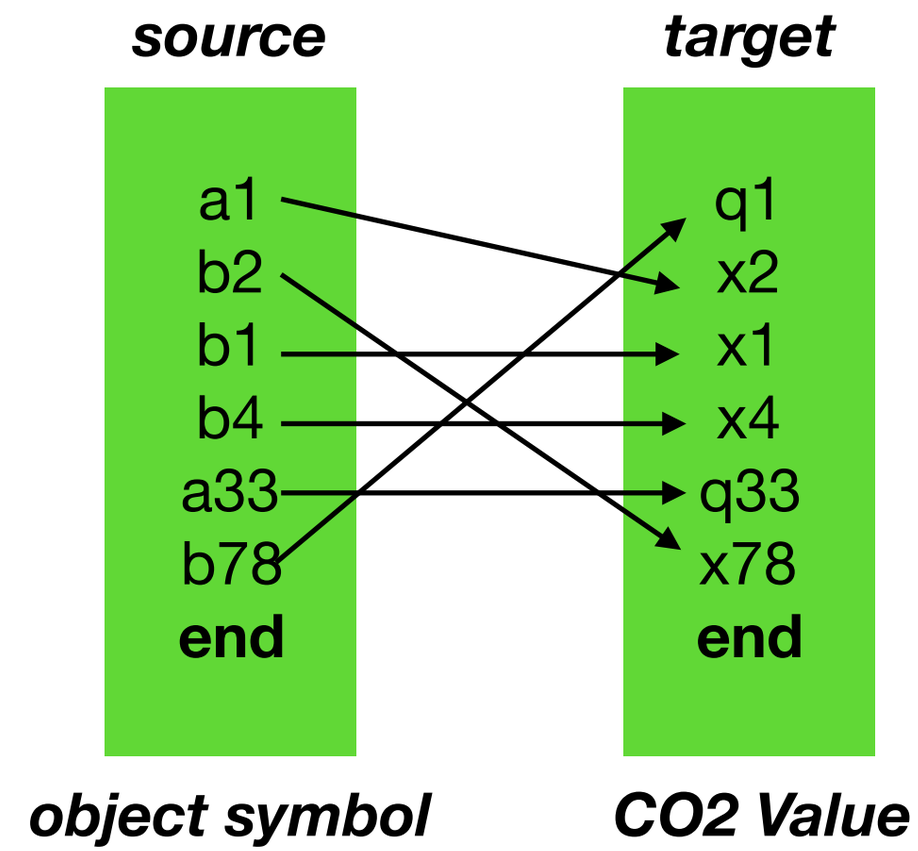
**provides a finite deterministic mapping of objects between model domains**

**There are infinite objects, models, and symbols.**

**However,**

The model which encodes production-consumption chains requires *a limited universe of symbols*, at accomplish mapping a **source** to a **target**

All symbols must be unique of course.



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| **waterbalancetank1** | 34 |
| **blendingmachine1** | 34 |
| **surgetank1** | ? |
| **filtermachine1** | ? |
| **cappingsealingmachine1** | ? |
| **shrinkpackagingmachine1** | ? |
| **reshrinkpackagingmachine1** | ? |
| **coldstorage1** | ? |
| **yakult1** | ? |
| **sugarcane1** | ? |
| **sugar1** | ? |
| **syrup1** | ? |
| **liquiverter1** | ? |
| **preparationtank1** | ? |
| **balancetank1** | ? |
| **htstunit1** | ? |
| **storagetank1** | ? |

# Naming: Machine + Protocol

20210909 Naming: Machine + Protocol

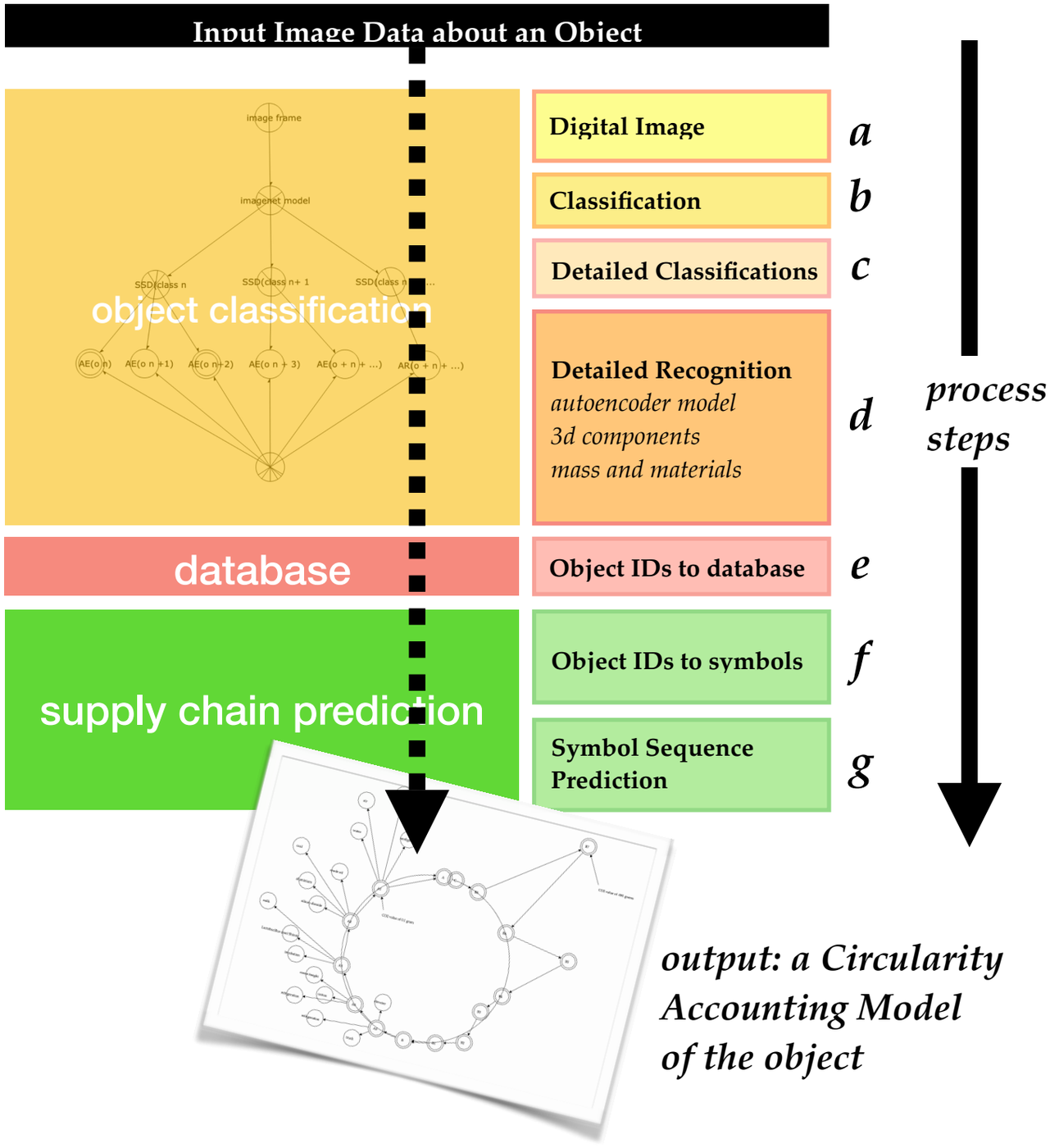
In production we may describe the actions of a machine, as in:
Machine + Protocol. In our model, instead of being domain restricted, we can use general terms, 'Object', and 'Behavior' of the object.

Object_Behavior
like this -
shrinkPackagingMachine1_StirFor37000ms

For non-machines, for example trees, Object_Behavior may be something like 'tree_grow', or for a human 'Person_DriveCar'.

The Symbols which we use, that represent positions in the chain, can only have one CO2 value. If an object may have multiple CO2 values, it is necessary to create multiple symbols. For example,

Person_DriveCar1
Person_DriveCar2


Input Image Data about an Object
image frame
imagenet model
SSD(class n
SSD(class n+ 1
object classification
AE(o n)
AE(o n +1)
AE(o n+2)
AE(o n + 3)
AE(o + n + ...)
AR(o + n + ...)
database
supply chain prediction
Digital Image
Classification
Detailed Classifications
Detailed Recognition
autoencoder model
3d components
mass and materials
Object IDs to database
Object IDs to symbols
Symbol Sequence Prediction
a
b
c
d
e
f
g
process steps
output: a Circularity Accounting Model of the object


**Input Image Data about an Object**

| | | |
|---|---|---|
| | **Digital Image** | *a* |
| metal object | **Classification** | *b* |
| water tank | **Detailed Classifications** | *c* |
| watertank1 | **Detailed Recognition**<br>*autoencoder model*<br>*3d components*<br>*mass and materials* | *d* |
| a1 | **Object IDs to database** | *e* |
| a1 | **Object IDs to symbols** | *f* |
| a1 b2 b1 b4 a33 b78 end | **Symbol Sequence Prediction** | *g* |

***process steps through different models (a—g)***

**finite deterministic mapping of objects between model domains**