Unleash maximum success

KSE Group

Efficient Simulation of Dosing and Weighing Systems in Animal Nutrition

Aron den Teuling – Simulation Engineer | Anylogic Conference 2024

Thinking out of the box

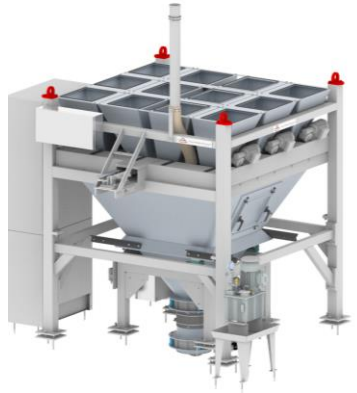
Let’s see what’s in the KSE box

Presentation outline

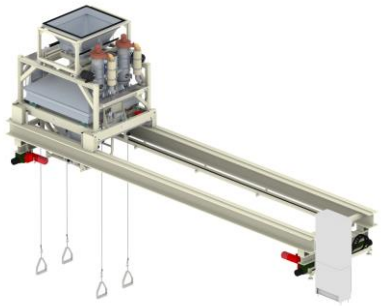
- Company Background
- Simulation Use: How and Why
- System Simulated Background
- Use Case: Methodology, Showcase and Future Directions

About – KSE Process Technology

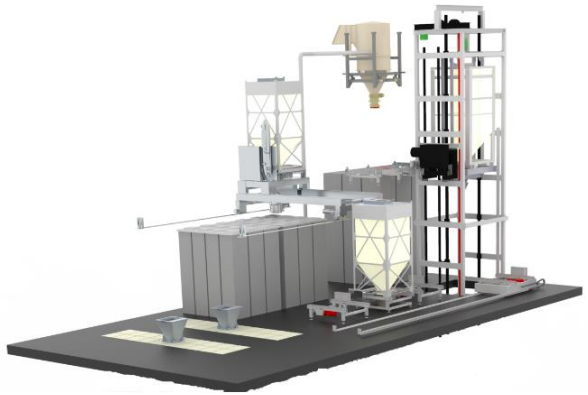
- Since 1973
- Dosing & weighing systems and smart automation software for the animal nutrition industry.
- Dosing and weighing machine for micro as well as macro dosing.
- From initial factory design and pre-engineering to mechanical construction, automation, and comprehensive after-care services, ensuring optimal performance and minimal issues.



KCD – stationary micro weigher

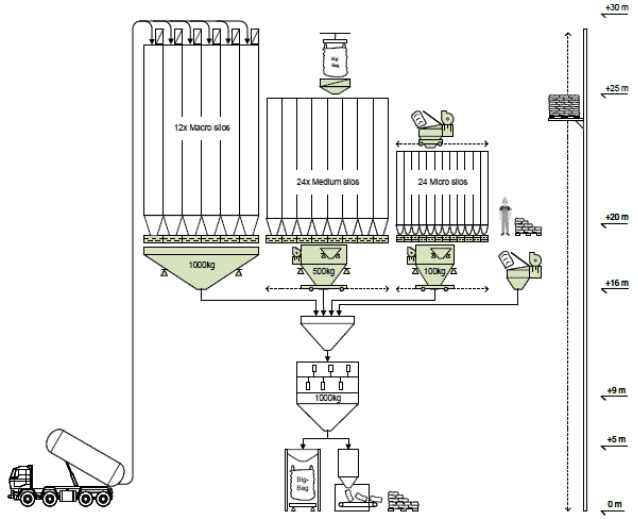


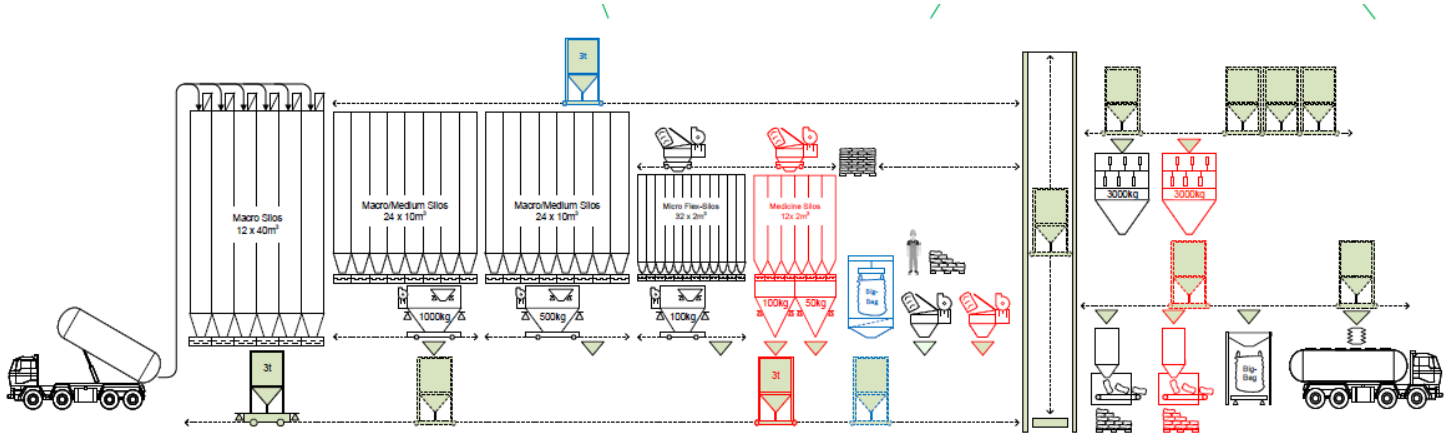
BCDxy – Movable macro weigher



ACT – Automated container transfer

From Basic to Highly Advanced





How we serve the customer

Dosing & weighing

With ALFRA, processing your solid ingredients will be effective now and in the future.
Whether it's about high precision weighing and dosing, careful handling to maintain product quality, flexibility
for different recipes or compositions, or high-speed bulk dosing, ALFRA machines are designed to perform for decades.

From plan to plant

KSE Projects will navigate you towards the most effective set-up of your production process. From initial requirement definition, design and engineering, to construction, implementation and continuous care. KSE Projects supports your business case every step of the way.

Process Automation

When operating a batch handling plant, delivering products in time is essential. Promas empowers you to master the most complex production processes. By crafting the ideal software solution for every batch operation, Promas lets you manage your production actively, making sure it runs smoothly for on-time delivery.

Your challenges is what drive us

“The factory of the future will have only two employees

a man and **a dog**. The man to feed the dog.

The dog to keep the man from touching the equipment.”

- Warren Bennis, Professor

KSE GROUP

DEFINITION
Raw material specs
Product(ion) data
Capacity
Quality
Flexibility
Future growth

ENGINEERING
Mechanical drawings
Electrical drawings
Automation specs
Planning
Quotations

IMPLEMENTATION
Installation
Commissioning
Start-up
Training
Handover

CONCEPT DESIGN
Process design
Mechanical design
Process simulation
Automation design
Project plan
Budget estimation

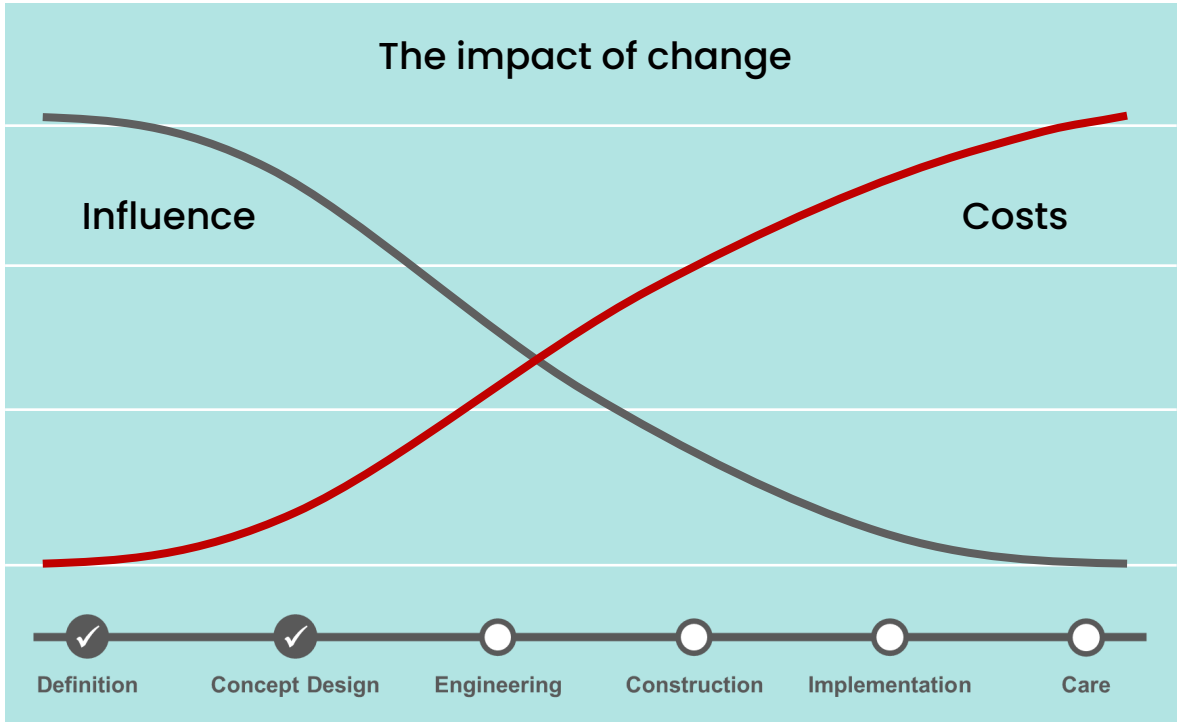
CONSTRUCTION
Make parts
Buy parts
Assembling
Testing (FAT)

CARE
Maintenance
Help desk
Spare parts
Production analysis
Upgrades
Optimization by simulation
Data analysis

Project route

Why we use (Anylogic) simulation?

- Highly complex, simple calculations impractical.
- Varying routes, dosing times, and wait times depend on the current situation.
- Clear visual representation.
- Facilitates internal communication.
- Clients of the factory configuration.
- Testing of different design concepts early in the process.
- Analysis of potential bottlenecks, utilization, wait times, and throughput.



Automated Container Transfer (ACT)

- For contamination free batch transport and storage of finished products and ingredients
- The modular setup provides high level of process flexibility
- Transfer different contamination groups on the same line

Automated container transfer (video)

Use-case: ACT Anylogic Tool

Requirements

- Robust and usable for multiple customers
- Quick simulations (no weeks-long processes)
- Customizable unit details (e.g., speeds, dosing times)
- User-friendly for our sales consultants, minimal simulation expertise needed
- Decent visualization
- Information about KPI's (throughput, waiting time etc)

Methodology

- Every ACT unit type is an agent type in Anylogic.
- Excel file with tune-able parameters which configurates the ACT units in the model.
- Locations of units are given as a node.
- Routing is based on routing algorithm in excel.
- Other input parameters are given by the excel file.

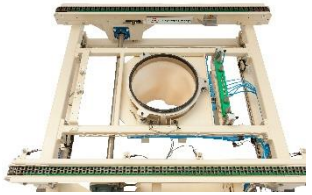
Use-case: ACT Anylogic Tool
Agent types in simulation model

Container Agents

- Container number
- Container type
- Start location
- Color

Discharging unit Agents

- Discharging time
- Location
- Name
- Type
- Orientation
- Flowchart

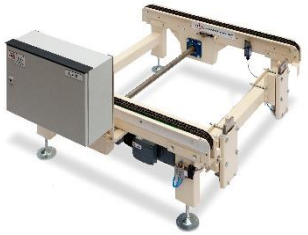


Vertical container transport Agents

- Speed
- Length
- Name
- Location
- Orientation
- Flow chart
- ....

Container Conveyor Agents

- Name
- Speed
- Location
- Length
- Orientation
- Flow chart
- ..

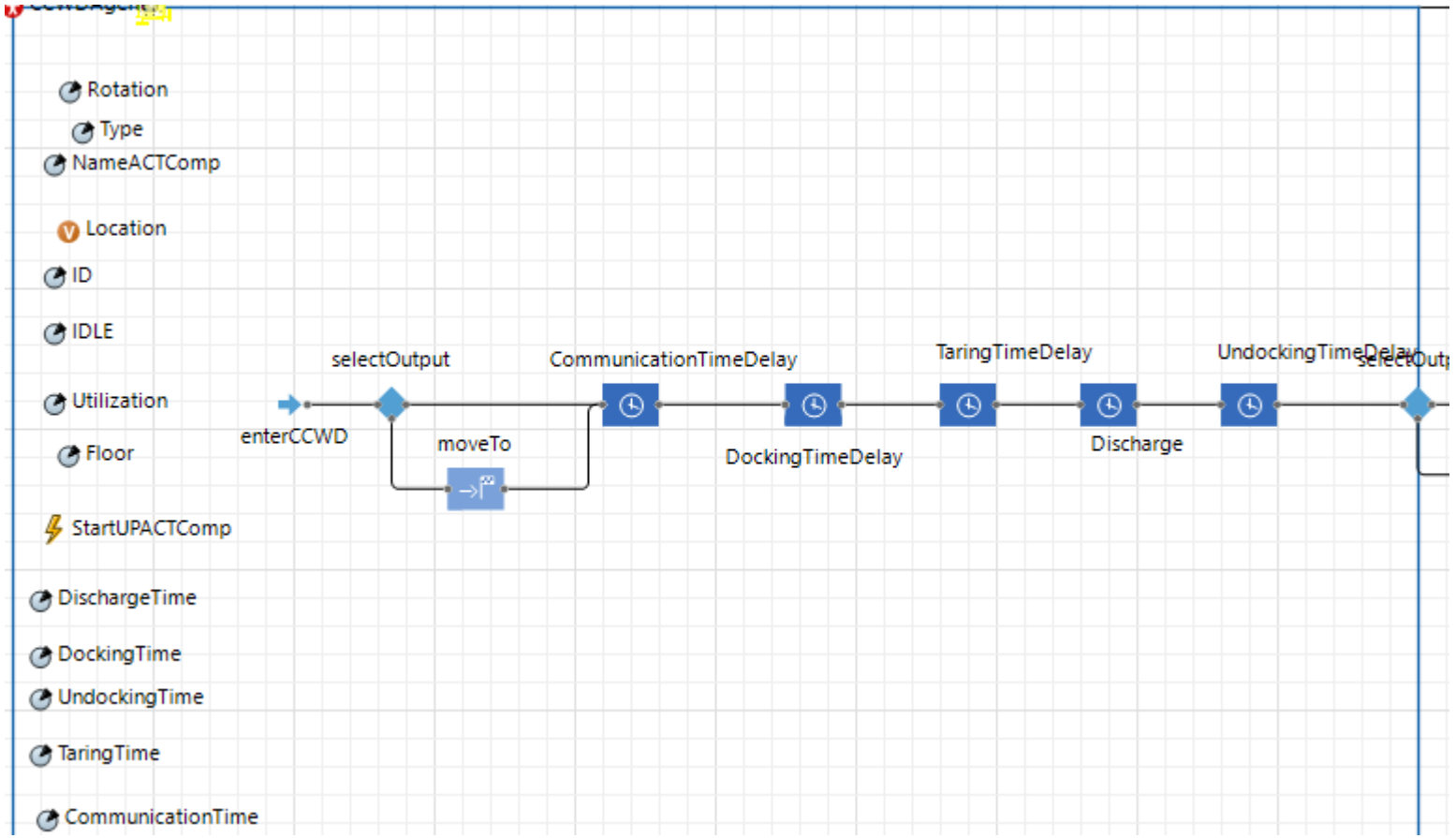


Dosing unit Agents

- Dosing time
- Location
- Name
- Orientation
- Flow chart
- ..

And many more agent types...

Use-case: ACT Anylogic Tool
Agent types in simulation model



Example of the flow-chart inside a discharging unit agent

Use-case: ACT Anylogic Tool

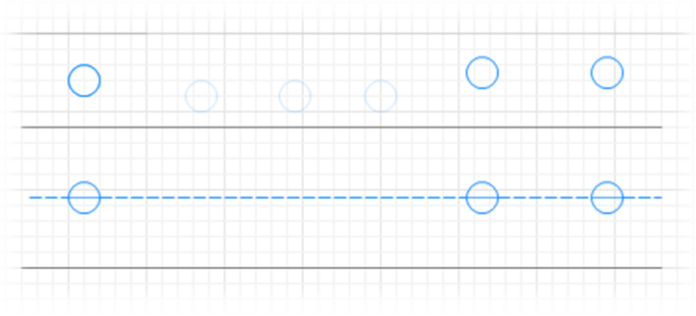
Step 1: Creating the lay–out of the ACT system

Initial approach

- Create whole model from **scratch**

Current approach

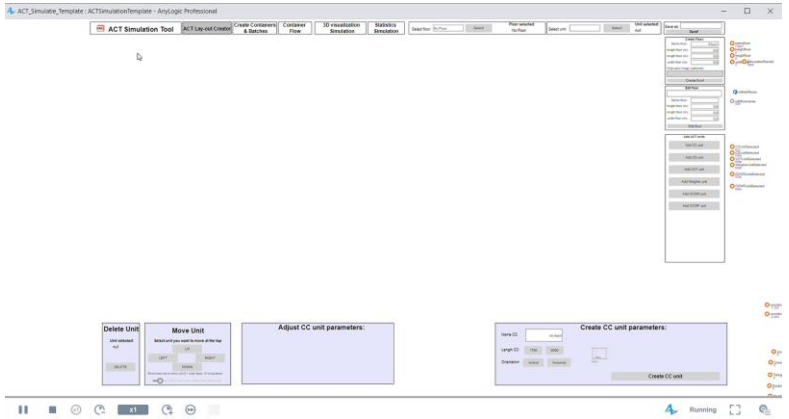
- Create the **floor plan** in Anylogic
- Create input of floor plan by **excel**



Location	Sort	Name	ID	RotationOfTheVisual	Length
nodeCC15	CC	CC15	4	0	1700
nodeCC18	CC	CC18	1	0	1700
nodeCC19	CC	CC19	2	0	1700
nodeCC13	CC	CC13	3	0	1700

Future approach

- **Everything** included in one tool



Use-case: ACT Anylogic Tool

Step 2: Create the container and container flow

Initial approach

- Create **containers** in Anylogic
- Every possible flow created by **unique** flow chart

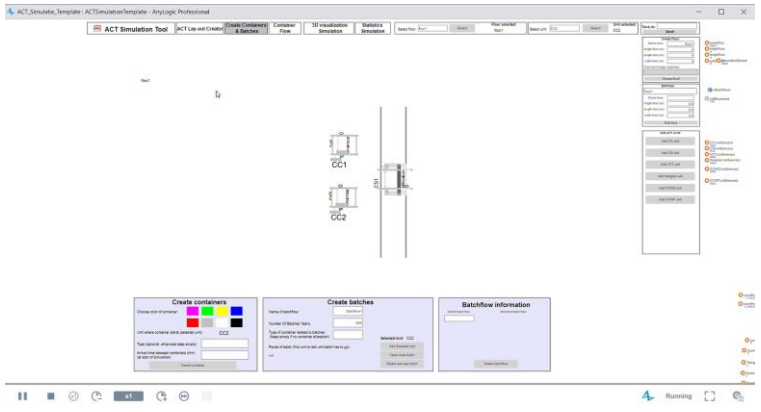
Current approach

- Create routes by **a simple excel algorithm**
- Insert container start location in **excel**
- Create batchflows in excel

art	End	Resources	ResourcesBuff
6	1	7,1	7,4
3	1	7,1	7,4
1	3	7,3	none
6	4	7,4	none
4	6	7,6	none
3	5	8,5	none
4	1	7,1	none
5	1	8,3,7,1	8,2
2	1	8,3,7,1	none
3	10	8,9,10	none
6	10	7,3,8,9,10	none
10	5	9,8,5	9,8,2
5	10	8,9,10	none
2	5	8,5	none
1	12	8,9,11,12	none
12	1	11,9,8,1	11,9,8,5
12	13	11,13	none
13	1	11,9,8,1	none

Future approach

- Connection with the container transport program algorithm used in **real factories.**
- Insert and create container/routes **easily** in the tool
- Load in **recipe** data



Use-case: ACT Anylogic Tool

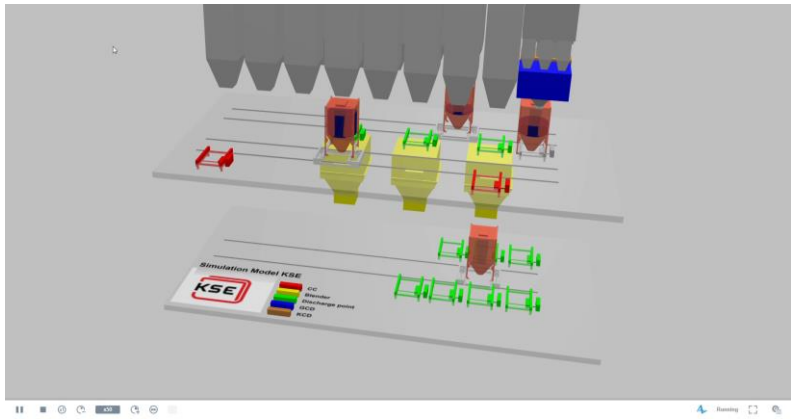
Step 3: Run the simulation and analyse the results

Initial approach

- Create charts from scratch

Current approach

- Model **directly** can be started with a visualization
- Standard KPI's are shown in the result section



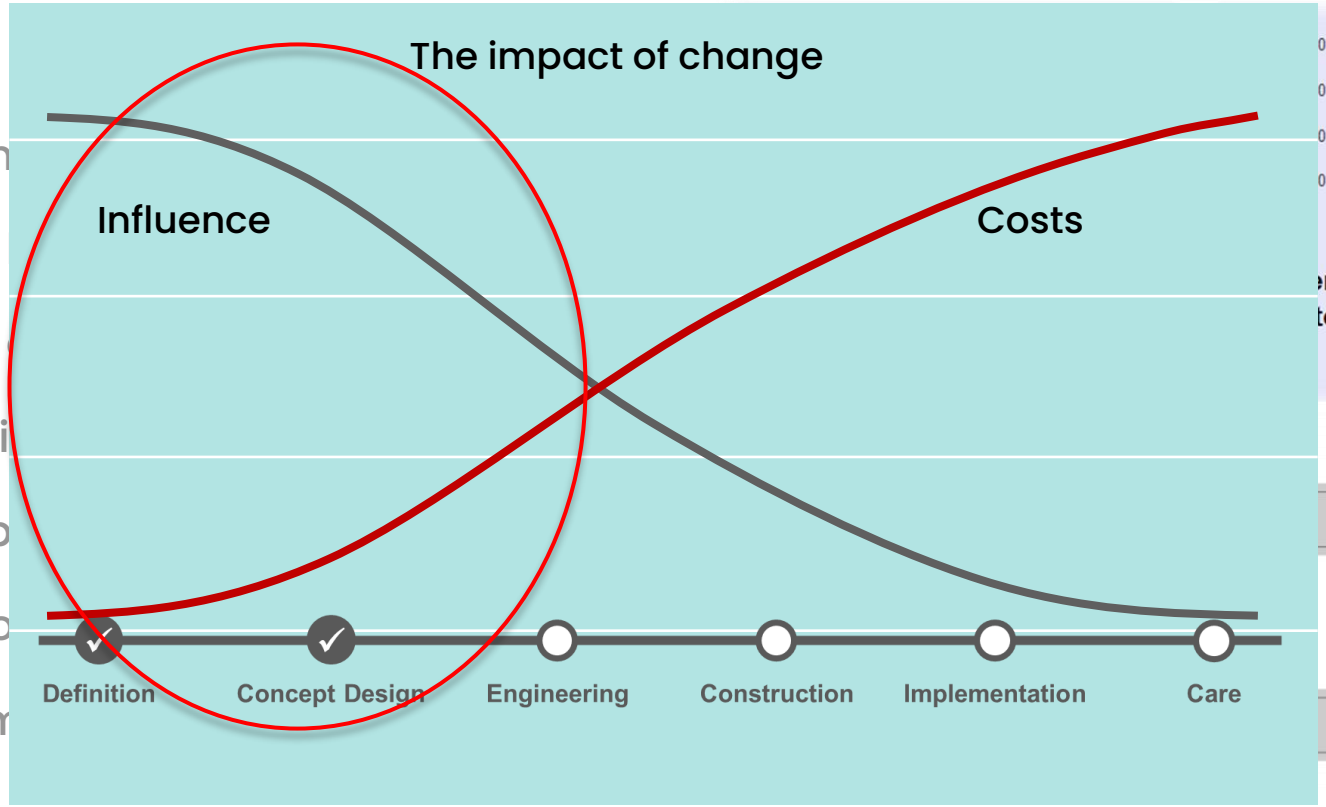
Future approach

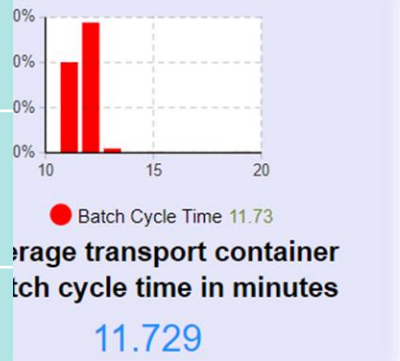
- **Artificial intelligence** tools provide deeper insights in performance and optimalization

Use-case: ACT Anylogic Tool

Results analysis

- Utilization
- Potential
- Potential
- Waiting ti
- Throughp
- Energy co
- Batch-tim





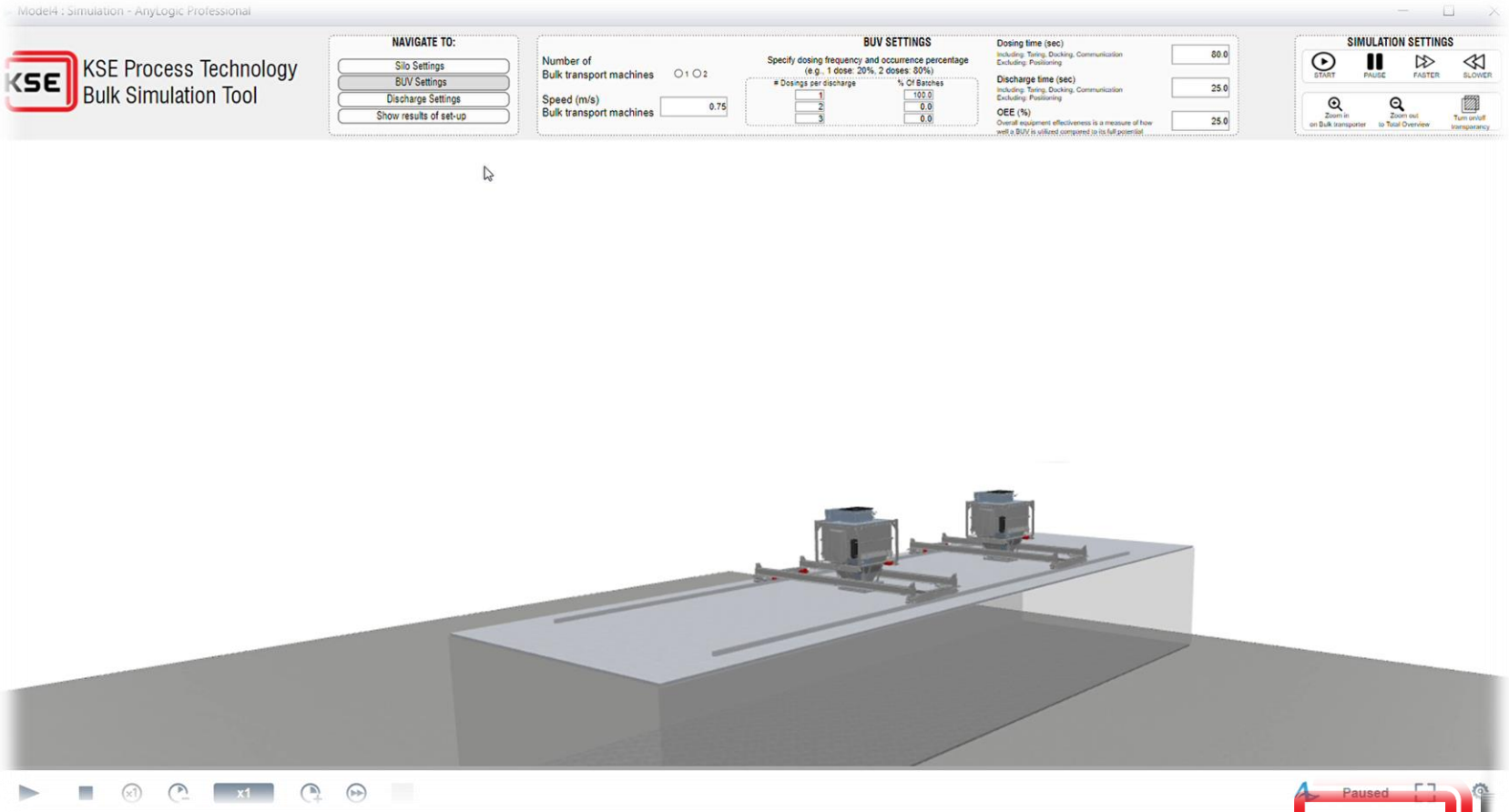
Other use-cases of simulation at KSE

Current Simulation Tools:

- Bulk transport tool
- Optimization of current factories
- Silo allocation problems

Potential Simulation Tools:

- Digital twins for production optimilisation
- ...



Thank you!

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