ShuttleDos Simulation

Flexible analysis of ShuttleDOS systems

Graphic 3D simulation provide an insight into the system

Dynamic system characteristics made transparent

Future experiences applied today

THE INNOVATION

Simulation with the **FlexSim** modelling tool

- Discrete event-oriented
- Object oriented
- Configurable
- Programmable
- Import of 3D objects (e.g. 3D-Studio Max)
- Open interface standards

Flexible analysis

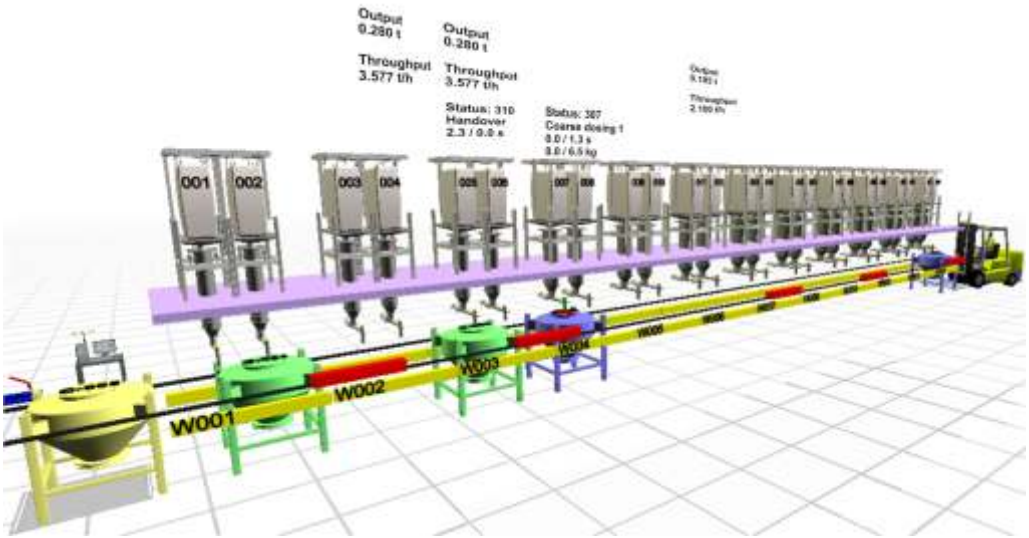
An actual plant equipped with AZO ShuttleDos systems requires complex analysis during the design phase to verify the specified output ratings.

An obvious solution is to accompany plant design with simulation. The versatile configurability of the simulation model makes it possible to respond flexibly to changes.

For instance, it is possible to modify the number of shuttle units, travel ranges, types of screw, recipe data etc. and then immediately observe the effects on the simulation model.

Graphic 3D model of the dynamic plant characteristics

The graphic 3D visualisation of the simulation model sheds light on the often unclear dynamic characteristics of the overall system.
Orders and recipes specified by the customer in advance are stored in the system to provide an initial visual impression of the future operational blueprint and characteristics of the plant.
In addition to making any bottlenecks clearly apparent this procedure also effectively pinpoints unutilised parts of the plant.
Experimenting with the number of shuttle units or changing the recipe sequence is also made immediately visible
in the plant dynamics.



Future experiences

Forecasts relating to achievable plant output, utilisation capacities, statistical evaluations, material provision recommendations, necessary plant equipment (number of mixers, number of shuttle unit, etc.) no longer need to be assumed but rather they can be considered as fact within the framework of the applied model accuracy.
This guarantees complete confidence in the plant from the very outset.

The simulation results make it possible to make decisions in terms of design measures, optimisation, saving options etc. in advance.

Benefits for the customer

By observing the simulation model, the customer can experience the future, as even in the planning stage he can see how his orders and recipes will materialise.
The simulation model can already answer a host of questions. The dynamic 3D model provides clear understanding of the plant behaviour such as in the initial startup period and during regular production, changes to recipes, as well as in specifically selected best-case and worst-case scenarios.

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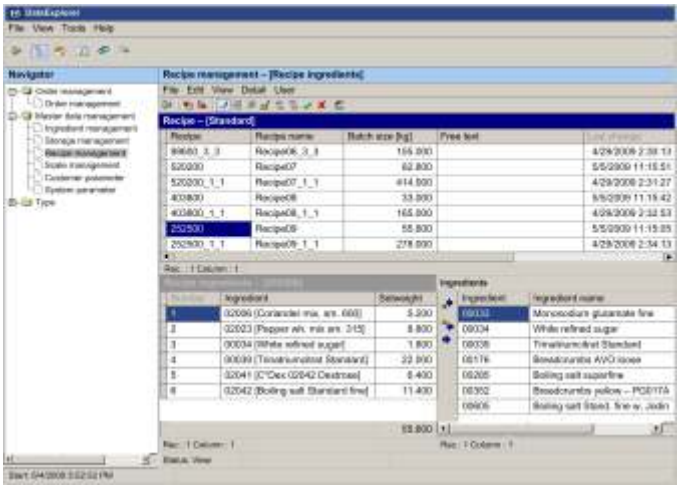
Model parameterisation

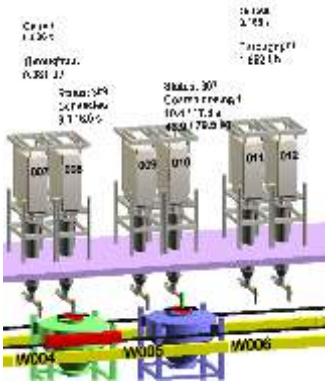
A database provides the operating parameters of the simulation model. This makes it possible to easily manage customer-specific order and recipe data as well as the components required for this purpose.
These data are just as decisive in terms of the time characteristics and the simulation sequence as the screw, scales and silo master data.

The layout of the plant, i.e. the number and geometric arrangement of the metering points, the number and travel range of the shuttles, the number and arrangement of the scales as well as other layout parameters are defined by an Excel configuration sheet.
Selecting Excel makes it possible to utilise the calculation and auto-fill functions provided by the table calculation for specifying coordinates, object sizes etc.



Evaluation of simulation data

Since all simulation runs are accompanied by a configurable data generation function, the visual impressions can be confirmed with concrete figures while providing measurable results in tabular and graphic form.
All result data are then made available to the customer.

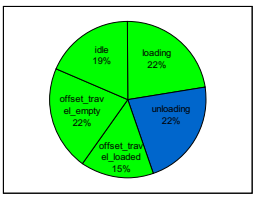


Gantt charts

The data determined during the simulation runs can be simultaneously recorded. The recorded events can be shown in the form of Gantt diagram for example. In this way the time correlation of weighing operations in relation to the docking - starting - taring - coarse flow - fine flow - afterrunning - undocking phases are made clearly visible.

Statistical evaluation

FlexSim makes available statistical evaluation tools such as pie charts for the individual simulation elements. These tools are designed to show dynamically the current utilisation level during the simulation run.



Parameter	Unit	Duration [s]	Total duration	Ereignis
				Start of shuttle: Start => SMX001006
3.700	m	10.700		End of travelling empty, loading container from
7.350	m	16.125	26.825	End of travelling loaded, unloading container to
				Start of collision-avoiding travel
				Start Shuttle: SMX001006 => SMX001010
				Start Shuttle: Start => Intermediate place by x
0.000	m	2.098		End of collision-avoiding travel
3.550	m	10.600		End of travelling empty, loading container from
7.300	m	15.198		End of travelling empty, loading container from
4.800	m	13.000	23.600	End of travelling loaded, unloading container to
6.170	m	14.712	29.911	End of travelling loaded, unloading container to
				Start of shuttle: Start => SMX001004

Event evaluation

Corresponding to the configuration, all relevant results relating to shuttle movements, metering and mixer procedures are documented in the record created by the simulation. These entries additionally contain evaluated simulation data such as distances covered by the shuttles or weight parameters for the metering points and scales. These data also contain the corresponding time stamp for procedures. Based on these numerical data, events such as the time a container, a batch (that can consist of several containers) or an order takes to pass through the entire system can be subsequently evaluated with the aid of corresponding sorting and filter functions.

Online results

Each simulation run provides valuable time-based information relating to the complete run, the total turnover quantity, batches and containers as well as the hourly output: quantity/h, batches/h and containers/h.

Account	Sim time	Total duration	Total amount	Batches total	Containers total	Quantity/h	Batch/h	Container/h
Unit	[dd.mm.jjj hh.nn.ss]	[d hh:nn:ss]	[kg]	[part]	[part]	[t/h]	[part/h]	[part/h]
After mixer	06/05/2009 10:57:54	0, 00:13:33	1825,800	1	2	8.079	5.8	8.9
In front of mixer	06/05/2009 10:57:47	0, 00:13:26	1825,800	2	4	8.149	10.7	21.3

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