Efficient cleaning will make you win time

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J-Tec Material Handling provides process engineering solutions to market leaders in the food industry and chemical industry all over the world. As a process partner we go beyond designing and building installations. For the food industry specifically, the **operational cost of the installation** is already taken into account at the design stage.

How ?

First, we examine **the actual cleaning time** in existing installations. Then we analyse **how the process can be optimized** and how these optimisations can be processed in new installations.

Frequently and for long periods shutting down an installation for cleaning and maintenance purposes is detrimental to a factory's efficiency. In the food industry, particularly in sectors where contaminations can occur, it is essential to minimize the number of cleanings on the one hand and optimize the cleaning times on the other.

Why is it necessary to clean the food installation?

Installations need to be cleaned for these two reasons:

Elimination of products or micro-organisms that are unspecific to the end product.

Prevention of contaminations between different runs or batches. Contaminations can occur in terms of taste and colour, or in case of allergens, vitamins or probiotics.

Analysis of the cleaning time in an existing installation for powder processing

To achieve measurable results, our food engineers have attended live cleanings. The tests were performed on a J-Tec mixing line for infant nutrition, in which powdered products, such as base powder, milk powder, vitamins, aroma and probiotics are being mixed. *(See image gravity mixing line)*

1. Research set-up

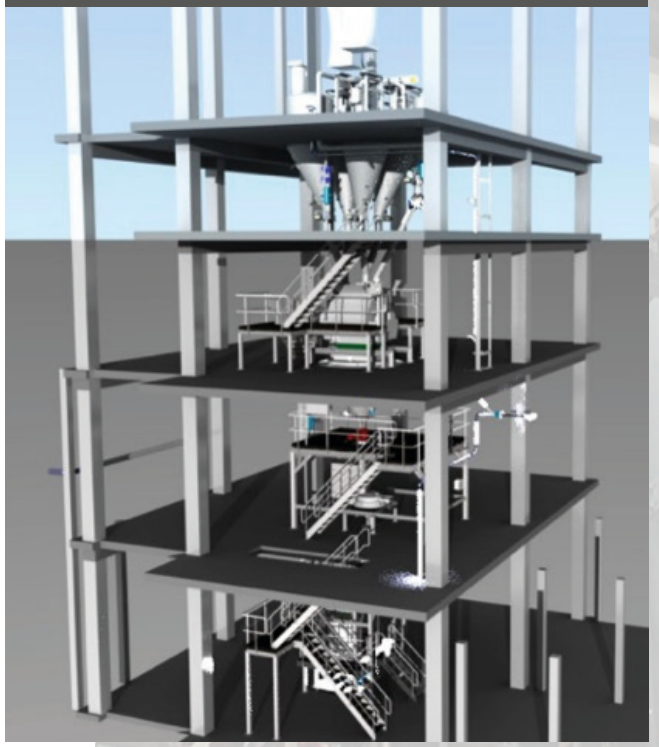
There are three dry substance cleaning methods. The nature and the degree of contamination determine the cleaning method.

Run empty: emptying the installation; Run empty is applied when the production remains within the same recipe. The emptying of the installation creates a clear separation between batches, facilitating the traceability of each batch.

Basic cleaning: vacuuming or blowing out the installation;
For a product change within the same product family, basic cleaning is the best cleaning option.

Profound cleaning: cleaning the installation with alcohol;
Profound cleaning is the most accurate and is applied if contamination on parts per million (ppm) level poses a health hazard, for example in the case of probiotics.
The installation is first cleaned by a run empty, followed by a basic cleaning and finally a profound cleaning.

The basic cleaning is carried out by means of vacuum cleaners. To measure how much residual product is left in the entire installation, the vacuumed product in the vacuum cleaners is weighed. The profound cleaning is performed with a cloth and alcohol.
The results of these tests are included in a table *(See next page)* and analysed.



An overview of the gravity mixing line for which the cleaning times were measured

“Product Free” cleaning

Level	Part	Items	Cleaning “Powder free” * (min)	Number of station(s)	Total (min)
13.5 m	1	Put the automation in cleaning mode & depressurize	14	1	14
13.5/8.4/4.9m	2	Apply LOTO incl. Administration on each level	9	3	27
13.5/8.4/4.9m	3	Collect & prepare cleaning tools on each level	3	4	12
13.5/8.4/4.9m	4	Remove, open & vacuum clean fluidisation nozzles	4	7	28
13.5m	5	Opening & vacuum clean BB dumping stations	17	4	68
13.5m	6	Opening & vacuum clean Bag dumping stations	10	1	10
13.5m	7	vacuum clean miscellaneous parts like flexibles and dedusting filter	3	4	12
8.4m	8	Remove,open & vacuum clean all J-Tec dosing valves	16	5	80
8.4m	9	Opening & vacuum clean Weighing hoppers	32	3	96
8.4m	10	Clean the chutes & hoppers by knocking with plastic hammer	5	1	5
8.4m	11	Opening & vacuum clean vibration tubes	30	1	30
8.4m	12	Opening and vacuum clean blender	81	1	81
8.4 m	13	vacuum clean miscellaneous parts like flexibles	18	1	18
8.4 m	14	vacuum clean dedusting filters	19	1	19
4.9m	15	Opening and vacuum clean rotary valve	15	1	15
4.9m	16	Install movable platform	2	1	2
4.9m	17	Opening and vacuum clean blenderhopper & bottom blender	70	1	70
4.9m	18	Opening and dismount sifter	15	1	15
4.9m	19	vacuum clean sieve cover	7	1	7
4.9m	20	remove and vacuum clean sieve pan	8	1	8
4.9m	21	vacuum clean sievedeck	4	1	4
4.9m	22	vacuum clean miscellaneous parts, chute and flexibles sieve	6	1	6
0m	23	opening rotating magnet and remove bars	2	1	2
0m	24	vacuum clean the rotating magnet housing	5	1	5
0m	25	opening and vacuum clean Magnet bars	8	1	8
0m	26	Dismounting sampler	1	2	2
0m	27	Open en vacuum clean sampler	2	2	4
0m	28	Open en vacuum clean level switch	2	2	4
0m	29	Clean the sampler tube	2	1	2
0m	30	Reclose sampler tube	3	1	3
0m	31	Reclose and install samplers	1	2	2
0m	32	Reclose and install level switch	2	2	4
0m	33	Reclose and install magnets bars	4	1	4
4.9m	34	Reclose and install sifter	14	1	14
4.9m	35	Reclose rotary valve	3	1	3
4.9m	36	Reclose blenderhopper and install flexible	6	1	6
4.9m	37	Reclose miscellaneous parts like dedusting filter	6	1	6
8.4m	38	Reclose the blender	15	1	15
8.4m	39	Reclose chutes	5	2	10

Extract from the overview of the cleaning times of all components (basic and profound cleaning)

2. Measuring results of the different cleanings

Run empty:
Measured duration = ± 15 minutes

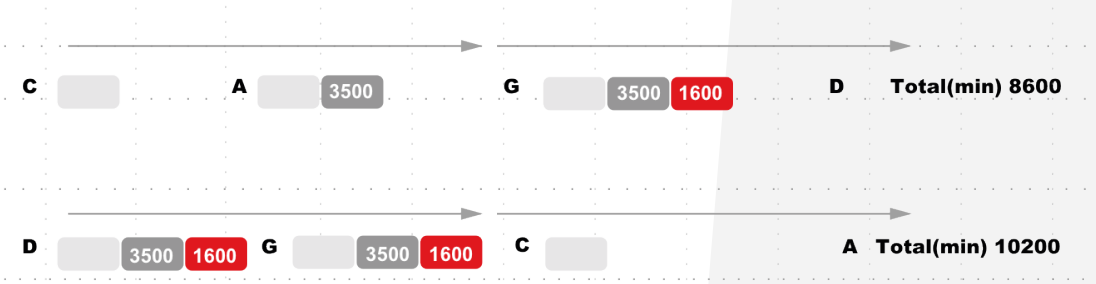
Basic cleaning:
Measured duration = ± 3500 minutes (after run empty)

Profound cleaning:
Measured duration = ± 1600 minutes (after basic cleaning)

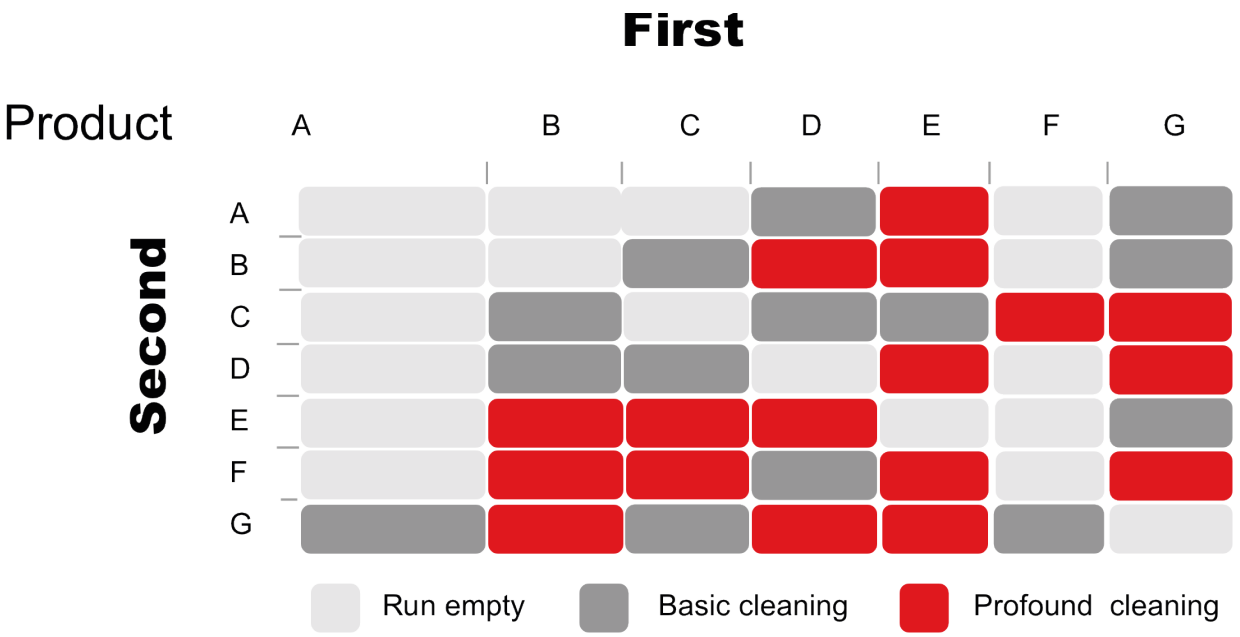
The results clearly showed that the actual cleaning times are significantly higher than the predetermined times. This means that the installation is stationary for too long during cleaning, and therefore is not running efficiently.

3. Consequence of the analysis

Since the measured cleaning times were considerably higher than planned, attention will be paid to three key points when building the new production lines. These optimisations will influence the cleaning frequency and consequently the total cleaning time, and will ultimately reduce the OPEX of the food installation.



Influence of the order of the cleaning on the total cleaning time.



Example of a cleaning matrix

Key point 1:

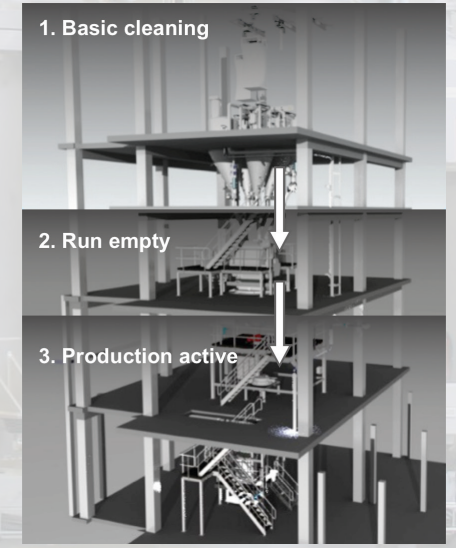
Reducing the number of cleanings by optimising product planning

To reduce the number of cleanings of an installation to the minimum, an efficient and well-thought-out production planning is essential. An efficient production planning takes the cleaning matrix into account. This matrix shows which type of cleaning takes place between certain recipes, runs or batches. *(See figure cleaning matrix)*

Key point 2:

More efficient course of the cleaning

A cleaning can be planned more efficiently by already initiating a basic cleaning when the bottom of the line is still to be cleaned by run empty.
Before this optimisation can be included in the production planning, it is necessary to do risk analyses to ensure the safety of the operators and products.



Optimization by starting the cleaning process while still producing

Key point 3:

Optimise cleaning time with lean concept and hygiene components

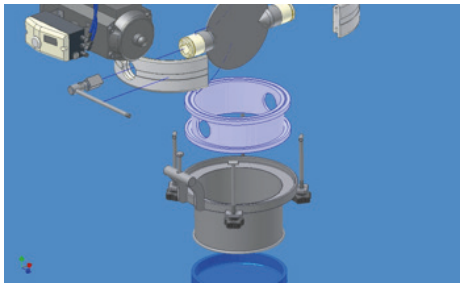
Lean engineering and hygienic design have a positive influence on the cleaning time of an installation.
A quickly detachable lock was integrated in the tested mixing line. This is retractable by means of sliding rods, making the lock easily accessible for maintenance. As a result, the cleaning time was considerably reduced to just 18 minutes, in contrast to a minimum of 120 minutes on an inaccessible lock. The hygienically designed lock combines various functions such as dosing and sealing, and is also a seal for pressure and flames.

Inaccessible air rotary valve

Standard butterfly valve that is difficult to disassemble and clean

For years, J-Tec has been focusing on lean engineering and hygienic design for the food industry. The J-Tec dosing valve is a nice example of that. The double function, sealing and dosing, of an easily detachable valve, is a piece of advanced engineering with attention to cleanability. The cleaning time for this component is only 30 minutes.

Quickly detachable air rotary valve



J-Tec quickly detachable dosing valve with dosing and sealing function

Conclusion

Leading companies are continuously looking for ways to do things faster and better than the competition. This is no different in the food industry. The starting point is always to be able to deliver similar or even higher quality to the end consumer. Specifically in the food industry, it is of major importance to not only have efficient production, but also to work with a lean and easy to clean installation, maintained by well-trained people using the right cleaning method.
In this way, the stationary time of an installation is minimised, and the operational costs are therefore reduced. This is how you win the race.

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