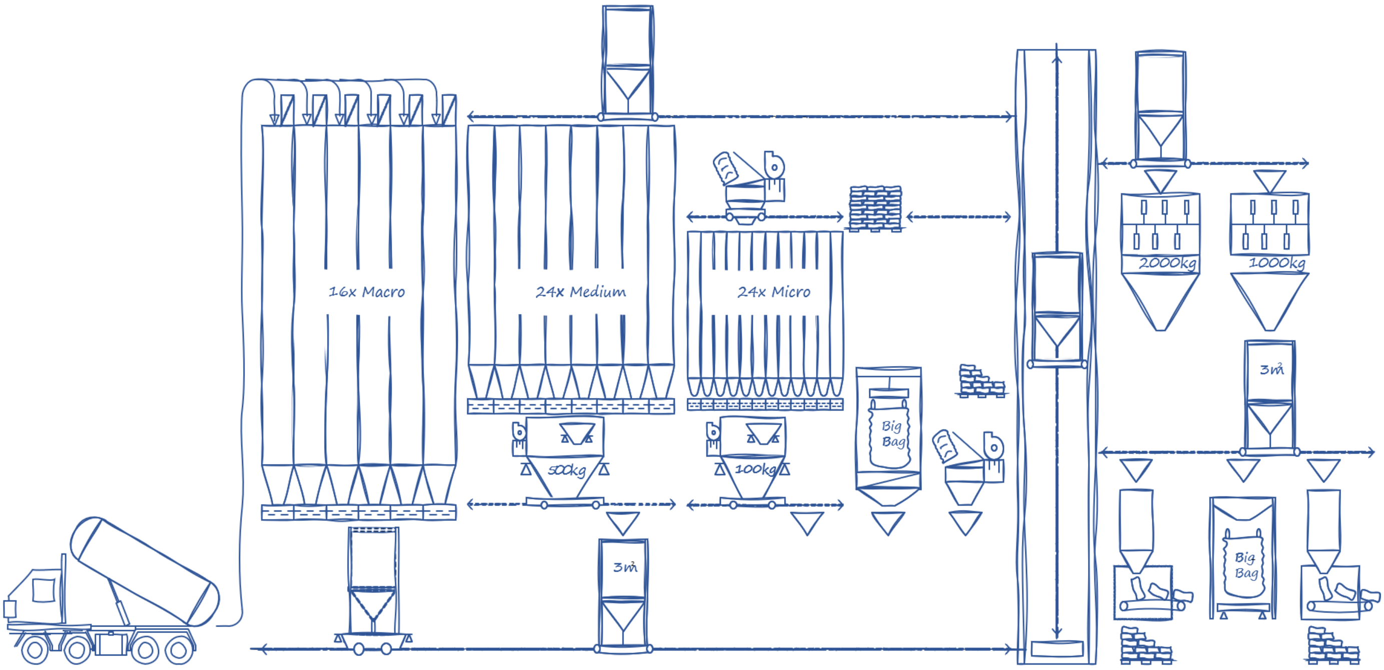
THE KSE DOSING DESIGN ANALYSIS TOOL



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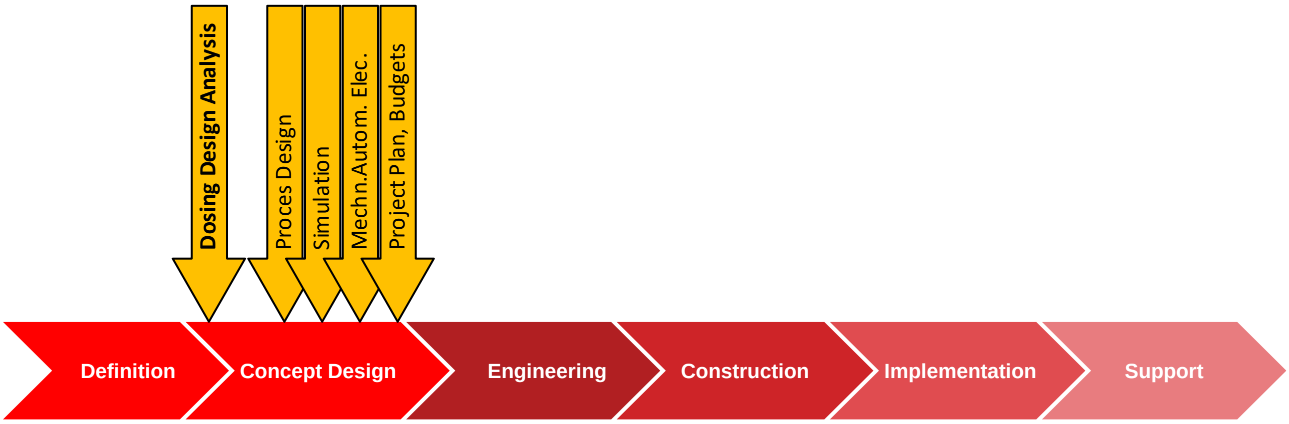
KSE Proven Process Technology
ALFRA Dosing & Weighing Technology
PROMAS Future Proof Automation

The KSE Dosing Design Analysis Tool supports your search for the right solution for the dosing and weighing of raw materials. It helps you achieve excellent dosing accuracy combined with high capacity, considering the flow characteristics of the product and the production environment.

Why this way? Well, as the saying: a good start is half the battle. Especially with the data we have at hand and the technology that can provide us with so much valuable insight to eliminate costly mistakes later.

The diagram below shows how a standard project proceeds, and the preferred position of the dosing design analysis:



Definition
The first step to determine the appropriate design by gathering relevant information on your process requirements. This means gathering customer requirements, specific local requirements and such to draw an outline of the project scope.

Concept design
In this step we test multiple possible process designs by use of computer models and simulations. In a matter of hours, we run years of virtual production through each process design, defining the optimal flexible design based on the parameters in the definition phase.

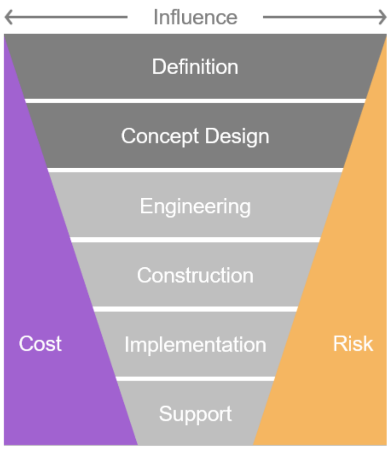
Engineering
Multidisciplinary teams engineer the complete mechatronic solution for each project. Mechanical, electrical and software experts cooperate closely to ensure each system is designed according to the latest quality, safety and performance requirements. All information should be at hand for a swift production process on time and on budget.

Construction
In this step engineering drawings are transformed into reality. Our equipment is constructed using a modular approach, enabling easy transportation and quick installation on site.

Implementation
During the process of installation, commissioning, testing and optimizing, your operators are trained to ensure that everyone is prepared to deliver an optimal performance every day.

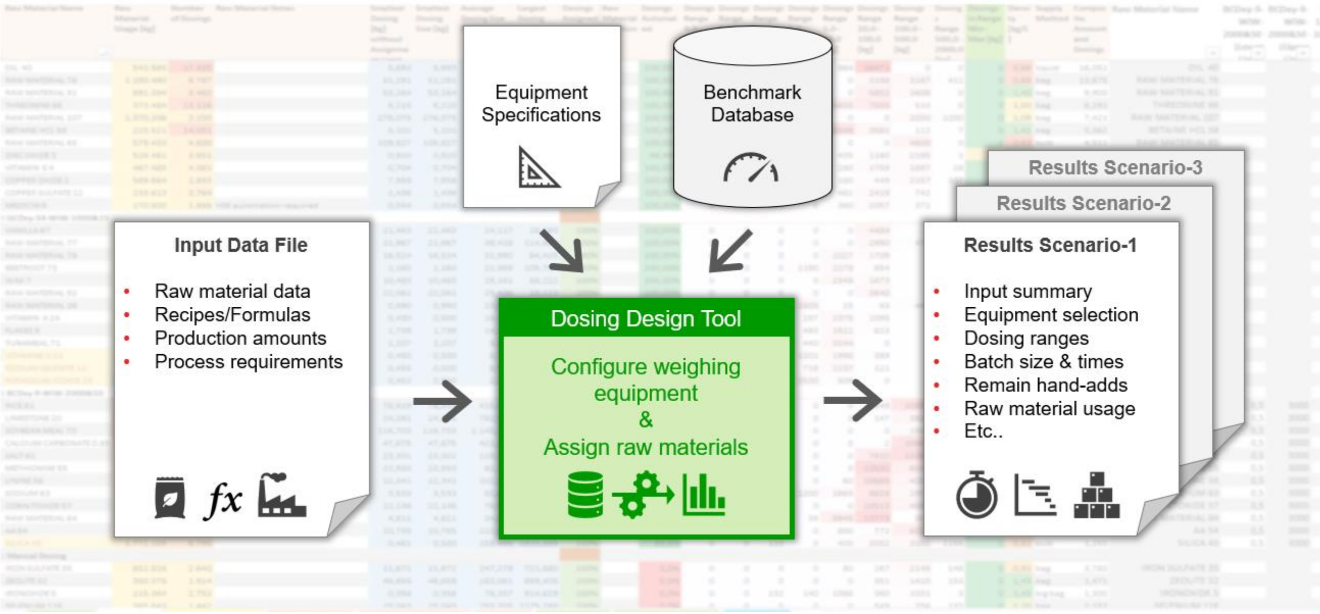
Support / Care
In order to ensure that our customers can continue to run a production according to the full potential of their factory, our experts remain involved to provide support; from bottleneck analysis of a production line to sourcing the right spare parts for the next scheduled maintenance stop.

Why invest in a good design?
A good planning saves time and money. Investing in a good design requires teamwork directly from the start of the project. Studying the process, starting with the Dosing Design Analysis, will eliminate risks at the start of the project, reduce unforeseen costs and prevent extra costs for possible changes needed later in the design. There is a direct relation to the amount of costs involved for a change the later you are in the process. Besides costs, risks are also much larger later in the process, not only budget wise but also in terms of timing and quality.



Impact of scope-change

So, what is that dosing design analysis? Here's how it works:
Step 1: What data is needed?
Step 2: What do we do with the data?
Step 3: What results are being generated?



Step 1: What data do we need for the Tool?
Basically, we require all data related to your recipes/formulations, raw materials, production and the current infrastructure of your plant.

Recipe data:

- All raw materials and recipes used and produced in your current plant and/or your future plans with these;
- All recipes with concerning raw materials (in % or kg) that will be produced in your project.

Raw material specs:

- Density;
- Supply method at delivery: mechanical bulk or pneumatic bulk, big bag and/or bag;
- Any known flow characteristics (flowability, floodability);
- Possible contamination groups.

Production data:

- Desired total production per year (KG/Y);
- Production times (hours/day, days/week, number of weeks/year);
- Expected efficiency of production (usually 70 to 80 % for feed, 50 to 70 % for premix or theoretical maximum);
- Number of production lines (mixers) and their shared resources;
- Per recipe:
    - Production amount per year;
    - Max., average and minimum batch size (expected) to produce;
- Required accuracy (what should be the global accuracy of the dosages: 1, 2, 3 or 4 %);
- Minimum acceptable number of hand additions (per day).

In case of an existing facility: data on the current weighers and silos which play a role in the project:

- Silo data:
    - Which silos are placed above which weighers with which raw materials?
    - What is the dosing speed per weigher?
    - What are the silo contents of the silos?
- Weigher data per weigher:
    - Weighing range;
    - Accuracy (readout);
    - Discharge speed-time.

Raw Material Name	Density [kg/L]	Supply Method(s)	Contamination Group	Notes
SOYBEAN MEAL 70	1,09	bulk		silo refill interval minimum 2 days
CALCIUM CARBONATE 0.85	1,1	bulk		silo refill interval minimum 2 days
LIMESTONE 20	0,69	bulk		silo refill interval minimum 2 days
COPPER OXIDE 2	0,75	big bag, bag		
RICE 61	1,4	big bag		silo refill interval minimum 2 days
ZINC OXIDE 3	1,39	big bag		
VITAMIN E 4	0,98	bag		
SALT 62	1,49	bulk, big bag		silo refill interval minimum 3 days
IRONOXIDE 5	1,43	big bag		
SILICA 45	0,81	bulk		
MEDICIN 6	0,86	bag	medicinal	HSE automation required
AA 54	0,71	bag	red	
WAX 7	1,03	bag		
METHIONINE 55	0,54	bag		
ACID	1,19	liquid		
LYSINE 56	1,35	bag		Flexsilo + knokkers
FLAKES 9	0,52	bag		Flexsilo + knokkers
RAW MATERIAL 107	1,09	bag		
RIBOFLAVIN 10	1,27	bag		
SODIUM 63	1,25	bag		
VITAMINE U 11	1,12	bag		
COBALTOXIDE 57	1,22	bag		
SODIUM SELENITE 12	0,66	bag		
RAW MATERIAL 76	0,68	bag		
CHOLINECHOLORIDE	1,09	bag		
RAW MATERIAL 64	1,33	bag	medicinal	
THIAMIN 14	0,74	bag		
IRON SULFATE 35	0,91	bag		
POTASSIUM IODIDE 15	1,32	bag		
RAW MATERIAL 91	1,4	bag		
BONEMEAL 16	1,21	bag		
RAW MATERIAL 65	0,63	bulk		
RAW MATERIAL 17	1,31	bulk		Flexsilo + knokkers
VITAMIN A 18	1,09	bag		
OIL 40	0,66	liquid		
RAW MATERIAL 19	1,38	bag	medicinal	
POTASSIUM 90	0,56	bag		
YEAST POWDER 21	0,59	bag		
COPPER SULFATE 22	1,23	bag		
THREONINE 66	1	bag		
MANGANESE SULFATE 23	0,71	bag		

Raw material data

Recipe Name	Raw Material Name	Percentage
Recipe Name 1	CALCIUM CARBONATE 0.85	63,9209
Recipe Name 1	COPPER OXIDE 2	2,5003
Recipe Name 1	ZINC OXIDE 3	12,3244
Recipe Name 1	VITAMIN E 4	8,1318
Recipe Name 1	IRONOXIDE 5	0,4993
Recipe Name 1	MEDICIN 6	1,9041
Recipe Name 1	WAX 7	0,4868
Recipe Name 1	ACID	1,4121
Recipe Name 1	FLAKES 9	1,9222
Recipe Name 1	RIBOFLAVIN 10	1,668
Recipe Name 1	VITAMINE U 11	0,1904
Recipe Name 1	SODIUM SELENITE 12	0,1053
Recipe Name 1	CHOLINECHOLORIDE	0,9153
Recipe Name 1	THIAMIN 14	0,5167
Recipe Name 1	POTASSIUM IODIDE 15	0,1825
Recipe Name 1	BONEMEAL 16	0,0964
Recipe Name 1	RAW MATERIAL 17	0,4666
Recipe Name 1	VITAMIN A 18	0,2079
Recipe Name 1	RAW MATERIAL 19	2,5491
Recipe Name 4	COPPER OXIDE 2	13,6065
Recipe Name 4	ZINC OXIDE 3	10,8296
Recipe Name 4	VITAMIN E 4	13,2449
Recipe Name 4	IRONOXIDE 5	4,8159
Recipe Name 4	MEDICIN 6	4,7771
Recipe Name 4	WAX 7	1,0238
Recipe Name 4	ACID	1,357
Recipe Name 4	FLAKES 9	0,8269
Recipe Name 4	RIBOFLAVIN 10	0,8721
Recipe Name 4	VITAMINE U 11	0,7633
Recipe Name 4	SODIUM SELENITE 12	0,5583
Recipe Name 4	CHOLINECHOLORIDE	0,3442
Recipe Name 4	THIAMIN 14	0,2556
Recipe Name 4	POTASSIUM IODIDE 15	0,1053
Recipe Name 4	BONEMEAL 16	0,1659
Recipe Name 4	VITAMIN A 18	0,1688
Recipe Name 4	LIMESTONE 20	20,5368
Recipe Name 4	COPPER SULFATE 22	4,6447
Recipe Name 4	[illegible]	1,0233
Recipe Name 4	IRON SULFATE 35	9,8698
Recipe Name 4	RAW MATERIAL 36	5,3873
Recipe Name 4	RAW MATERIAL 37	3,815

Recipes / Formulas

Recipe Name	Minimum Batch Size	Average Batch Size [kg]	Maximum Batch Size	Production Amount [kg/year]
Recipe Name 100	2250	2500	2750	5.000.000
Recipe Name 68	2250	2500	2750	5.000.000
Recipe Name 66	2250	2500	2750	5.000.000
Recipe Name 101	2250	2500	2750	5.000.000
Recipe Name 147	2250	2500	2750	3.000.000
Recipe Name 85	2250	2500	2750	3.000.000
Recipe Name 210	2250	2500	2750	3.000.000
Recipe Name 134	2250	2500	2750	2.000.000
Recipe Name 123	2250	2500	2750	2.000.000
Recipe Name 102	2250	2500	2750	2.000.000
Recipe Name 204	2250	2500	2750	2.000.000
Recipe Name 103	2250	2500	2750	2.000.000
Recipe Name 151	2250	2500	2750	2.000.000
Recipe Name 82	2250	2500	2750	1.000.000
Recipe Name 226	2250	2500	2750	1.000.000
Recipe Name 81	2250	2500	2750	1.000.000
Recipe Name 128	2250	2500	2750	1.000.000
Recipe Name 65	2250	2500	2750	500.000
Recipe Name 180	2250	2500	2750	500.000
Recipe Name 84	2250	2500	2750	500.000
Recipe Name 150	2250	2500	2750	500.000
Recipe Name 208	2250	2500	2750	500.000
Recipe Name 78	2250	2500	2750	500.000
Recipe Name 23	2250	2500	2750	500.000
Recipe Name 145	2250	2500	2750	500.000
Recipe Name 149	2250	2500	2750	500.000
Recipe Name 144	2250	2500	2750	500.000
Recipe Name 79	2250	2500	2750	500.000
Recipe Name 133	2250	2500	2750	500.000
Recipe Name 207	2250	2500	2750	500.000
Recipe Name 203	2250	2500	2750	500.000
Recipe Name 3	2250	2500	2750	500.000
Recipe Name 99	[illegible]	[illegible]	[illegible]	500.000
Recipe Name 186	2250	2500	[illegible]	300.000
Recipe Name 50	2250	2500	[illegible]	300.000
Recipe Name 155	2250	2500	[illegible]	300.000

Production data

How to provide this data?
You will receive an Excel template file from us to fill out. Experience tells us that nowadays all the above-mentioned data can be extracted quite easily from optimization and/or ERP systems.

Typically, we as well as our customers work with a signed NDA-agreement in this stage. This ensures that both your data and our knowledge will only be used for your project and will not end up in the wrong hands.

Step 2: What is the purpose of the data?
All the above-mentioned data supplemented with our know-how is brought together in the KSE Dosing Design Tool. We add our specific knowledge on machines, designs and other historic data from many running systems with anonymous data and measure the dosing speed and accuracies in relation to the design and needed production statistics. Flow characteristics of raw materials are determined either by experience from the past or by research with test equipment to determine the flowability and flood ability. We also investigate additional activation options such as the use of stirring devices, bellows, etc.

Step 3: What results are being generated?
The analysis will generate solutions for multiple scenarios such as to be deployed weighing systems, with corresponding dosing slides and the number of silos that are appropriate for your formulation and desired production capacity. The report that will be compiled for you will contain the following content:

A summary of assumptions:

- Total production per year (tonnage) and available production hours;
- Charge time (the time within which each weigher is expected to have completed its doses);
- Total number of produced batches per year;
- The number of invested raw materials remaining hand additions (number and kg).

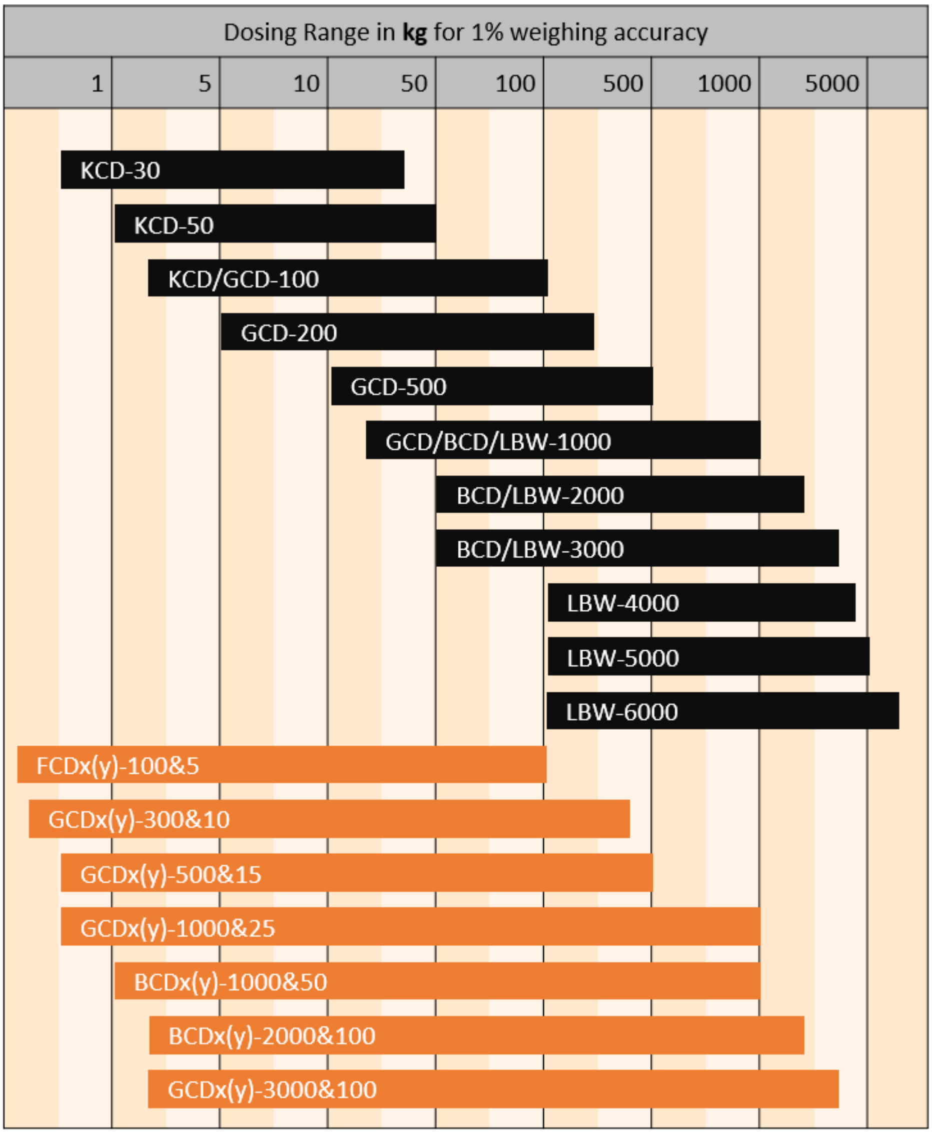
For example:

Analysis Input Summary	
Production Amount [ton/year]	67.070
Number of Distinct Raw Materials	150
Number of Recipes	227
Average Number of Raw Materials (μ ± 2σ)	14.37 ± 7.60
Maximum Number of Raw Materials in Batch	29
Number of Dosings	385.564
Average Batch Weight [kg]	2.500
Average Batch Volume [L]	2.642
Maximum Batch Weight [kg]	2.750
Maximum Batch Volume [L]	4.873
Number of Batches	**26.828**
Working Hours/Day	16
Working Days/Week	5
Working Weeks/Year	50
Overall Efficiency	0,85
Available Effective Production Hours	3.400
Target Batch Time [min]	**7,6**

A summary of the required weighers and silos, possibly with several combination possibilities:

- Min. and max. quantity to be dosed (weight and volume) of all raw materials;
- Total number of doses per year per system, justifying the purchase;
- Level of automation of the proposed scenario's;
- Number of dosing positions (silos) per system, with the invested raw materials;
- Batch time of all recipes;
- Percentage of batch time exceeded;
- Per charge:
  - Smallest, average and maximum dose;
  - Max. charge in weight and volume;
  - Average number of doses;
  - Possible extra discharges.
- Possible reserve for future expansion
- Possible amount of filling and other manual actions needed

For example:



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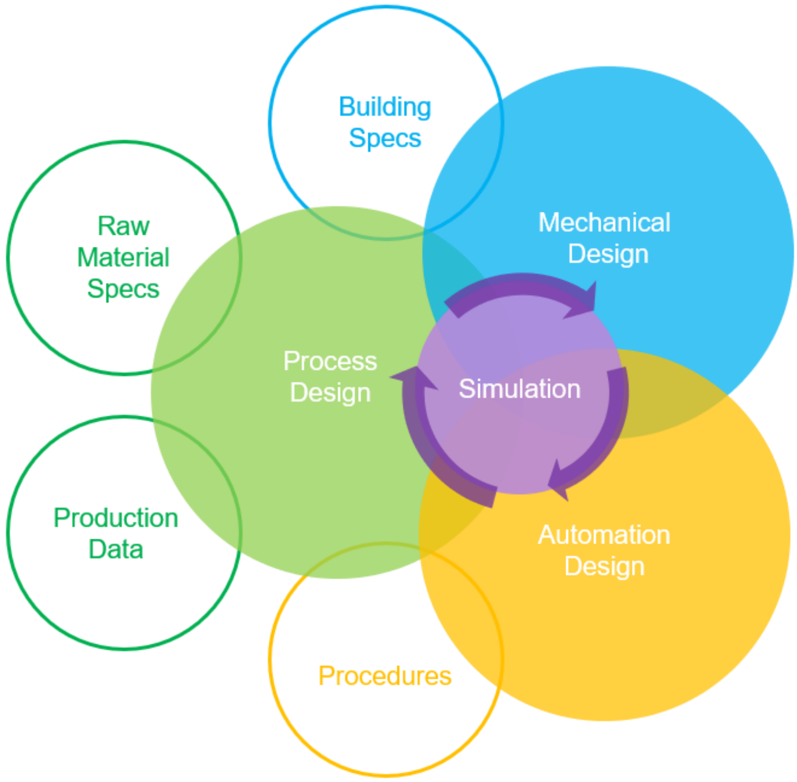
An overview of raw materials (silo):

- Allocation, which weigher;
- Number of doses per year;
- Consumption per week, per year;
- Proposed silo content;
- Number of fillings, intervals per day;
- Maximum, average and smallest dosage.

For example:

Article on Machine	Raw Material Number	Estimated Number of Dosings	Estimated Raw Material Usage [kg]	Weekly Raw Material Usage [kg]	Weekly Raw Material Volume [m^3]	Assumed Average Machine Silo Size [m^3]	Yearly Average Silo Refill Interval [days]	Smallest Dosing Size [kg]	Average Dosing Size [kg]	Largest Dosing Size [kg]	Lower Limit Assignment Range [kg]	Upper Limit Assignment Range [kg]	Machine Index
Manual Dosing													
Acid Buf	34	1 260	7 560	145	0.1	1	53.44	5.996	6.000	6.004	0	3000	1
LipiTec Piggy	30	52	780	15	0.0	1	564.67	14.990	15.000	15.010	0	3000	1
M1 ALFRA FCDc-12-WiW-100&5													
Lysine	10	26 665	169 067	3 251	4.6	1	1.53	4.197	6.340	7.685	0.04	100	2
Tryptophane	13	26 665	4 156	80	0.1	1	62.19	0.090	0.156	1.201	0.04	100	2
NaCl Salt	31	26 665	61 425	1 181	1.1	1	6.58	0.075	2.304	6.004	0.04	100	2
Biotine	25	26 665	12 023	231	0.4	1	18.47	0.075	0.451	0.826	0.04	100	2
Cholinecloride	24	26 665	21 873	421	0.7	1	10.15	0.300	0.820	1.201	0.04	100	2
Arginine	15	26 613	2 386	46	0.1	1	108.30	0.045	0.090	0.225	0.04	100	2
Enzyme Mix Poultry	22	19 264	5 779	111	0.2	1	38.42	0.300	0.300	0.300	0.04	100	2
Enzyme Mix Pig	21	7 401	2 220	43	0.1	1	100.00	0.300	0.300	0.300	0.04	100	2
Valine	14	1 469	127	2	0.0	1	2028.41	0.075	0.087	0.180	0.04	100	2
ColorMix	27	1 260	945	18	0.0	1	350.52	0.750	0.750	0.751	0.04	100	2
AminoMix	16	52	8	0	0.0	1	33133.33	0.150	0.150	0.150	0.04	100	2
Premix Piglet	2	52	390	8	0.0	1	1036.00	7.495	7.500	7.505	0.04	100	2
M2 ALFRA KCD-12-1W-50													
Threonine	12	26 665	187 953	3 614	5.1	1.5	2.06	1.649	7.049	9.802	0.5	50	3
Vit E50	26	26 665	17 605	339	0.6	1.5	18.92	0.600	0.660	1.201	0.5	50	3
Methionine	11	26 665	77 074	1 482	2.1	1.5	5.03	1.274	2.890	4.878	0.5	50	3
MycoFix	29	25 405	38 108	733	0.5	1.5	20.06	1.499	1.500	1.501	0.5	50	3
Na-bicarbonate	32	19 264	124 592	2 396	2.2	1.5	4.86	3.748	6.468	7.580	0.5	50	3
Clostat	37	18 004	27 006	519	0.8	1.5	12.53	1.499	1.500	1.501	0.5	50	3
Premix Kylling	5	12 703	95 273	1 832	1.7	1.5	6.36	7.495	7.500	7.505	0.5	50	3
BenzoAcid	35	7 401	55 508	1 067	1.4	1.5	7.28	7.495	7.500	7.505	0.5	50	3
Premix Kalkun	6	5 301	39 758	765	0.7	1.5	15.24	7.495	7.500	7.505	0.5	50	3
Premix Pigs	3	5 249	23 621	454	0.4	1.5	25.66	4.497	4.500	4.503	0.5	50	3
Premix Purke	4	2 100	9 450	182	0.2	1.5	64.13	4.497	4.500	4.503	0.5	50	3
Premix Layer	7	1 260	3 780	73	0.1	1.5	160.33	2.998	3.000	3.002	0.5	50	3

What's next?
Possible next steps include mechanical pre-engineering, automation and simulation. In this process we integrate the weighers and silos into the design and look into the process of the discharge of the weighers to the mixers and the filling of the raw material silos. It goes without saying that, always, we are taking your starting points into account, such as: cost, energy consumption, contamination, product handling and charge, whether it concerns a greenfield or brownfield project.



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