

**FEED  
TECHNO  
VISION  
2022**



# Optimizing process technology in times of Grain and Energy scarcity Part 1



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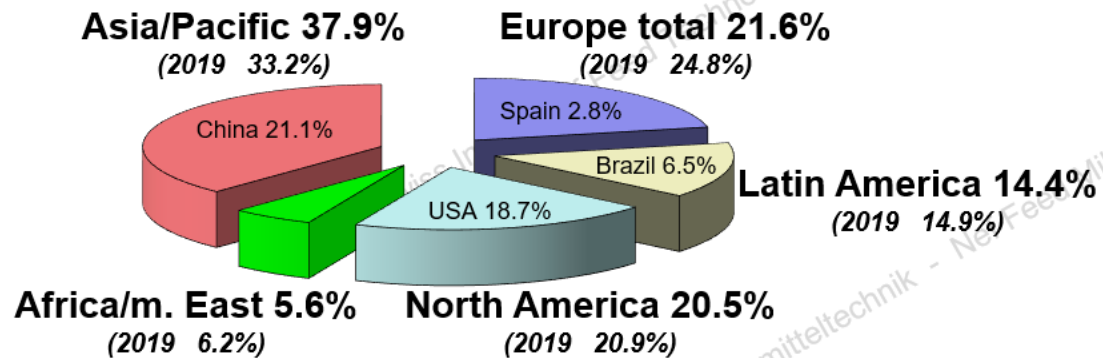


 **trouw nutrition**  
a Nutreco company

# The Feed Milling Industry – an important link in the food chain

## World feed production 2021 (estimated)

**1'235.5 Mio. t** (2019 >> 1'126.5 Mio.t >> 9.67% growth)



source: **Alltech** Survey January 2022

Task of the Feed Milling Industry is ...

*... to manufacture a feed homogeneous as possible to fulfil the feed conversion expected by the animal.*

*Every animal should receive daily all nutrients and active substances as prescribed in the formulation in **sufficient quantity** and of **correct quality**.*



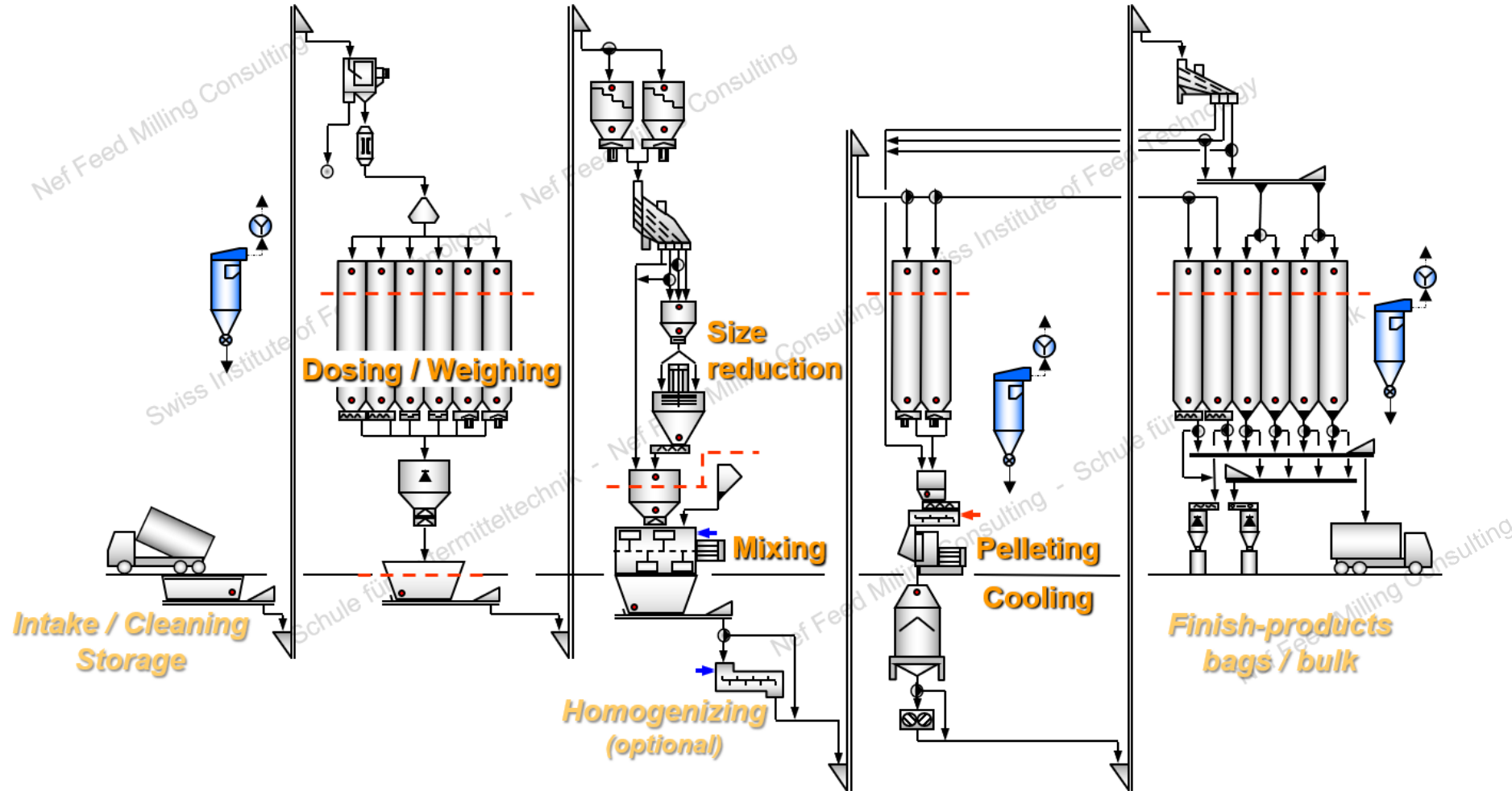
## Raw material procurement

- ◆ *Search for alternative products.*  
*Quality, Quantity, Price, Delivery time etc.*

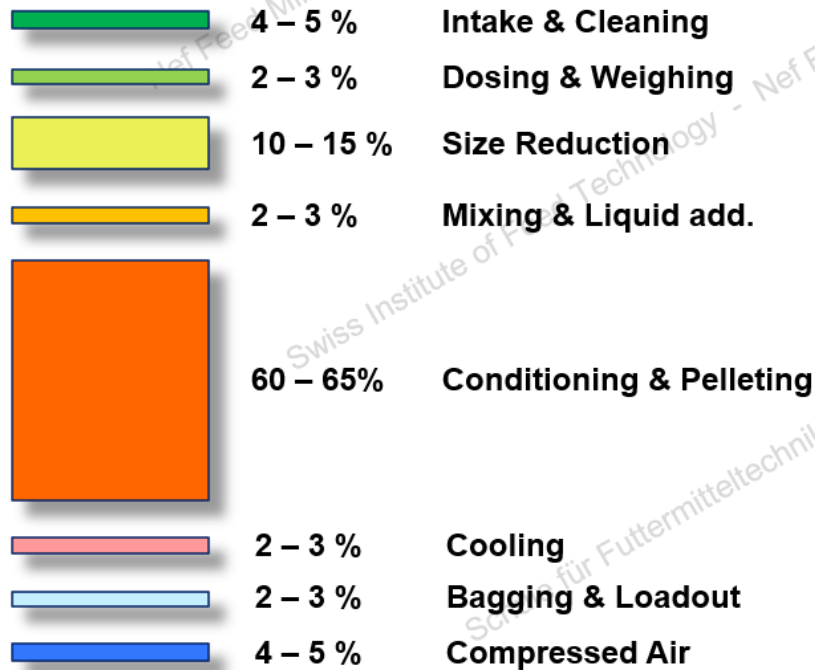
## Raw material properties affecting the manufacturing process

- ◆ *Physical characteristics.*  
*Bulk density, Particle size, Moisture content etc.*
- ◆ *Chemical characteristics (nutritive value).*  
*Crude fat, Crude protein, Crude fibre etc.*
- ◆ *Specific characteristics.*  
*Place of origin, Age, Previous processes etc.*

# Affected core processes with frequent changing product properties



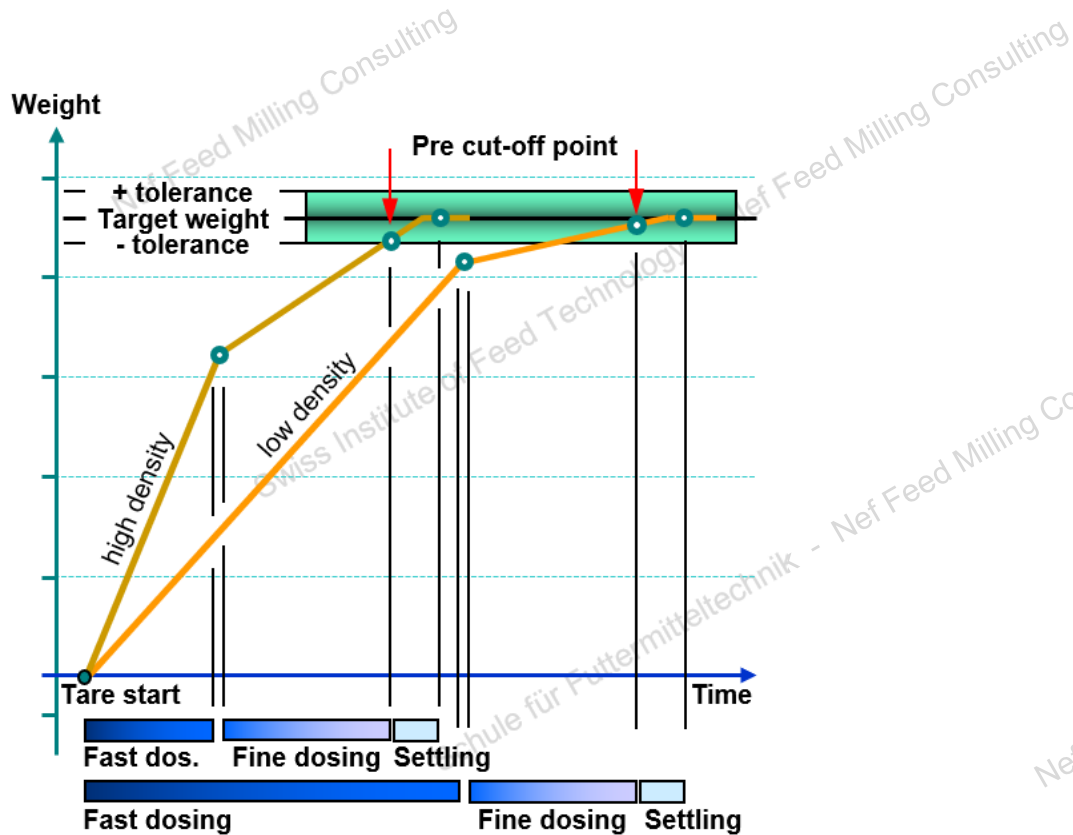
# Energy consumption (kWh/t) in the individual process sections in %



## ⚡ Approx. energy share per ton of livestock feed

- ◆ *60% electrical, 40% thermal energy.*
- ◆ *90% of electrical used to drive motors.*
- ◆ *Largest energy consumers ....*
  - .... *Size reduction.*
  - .... *Conditioning & Pelleting.*
- ◆ *Compressed air often underestimated.*
- ◆ *Supporting functions not considered.*  
*Building, Maintenance, Automation etc.*

# Dosing & weighing – good quality starts with high accuracy



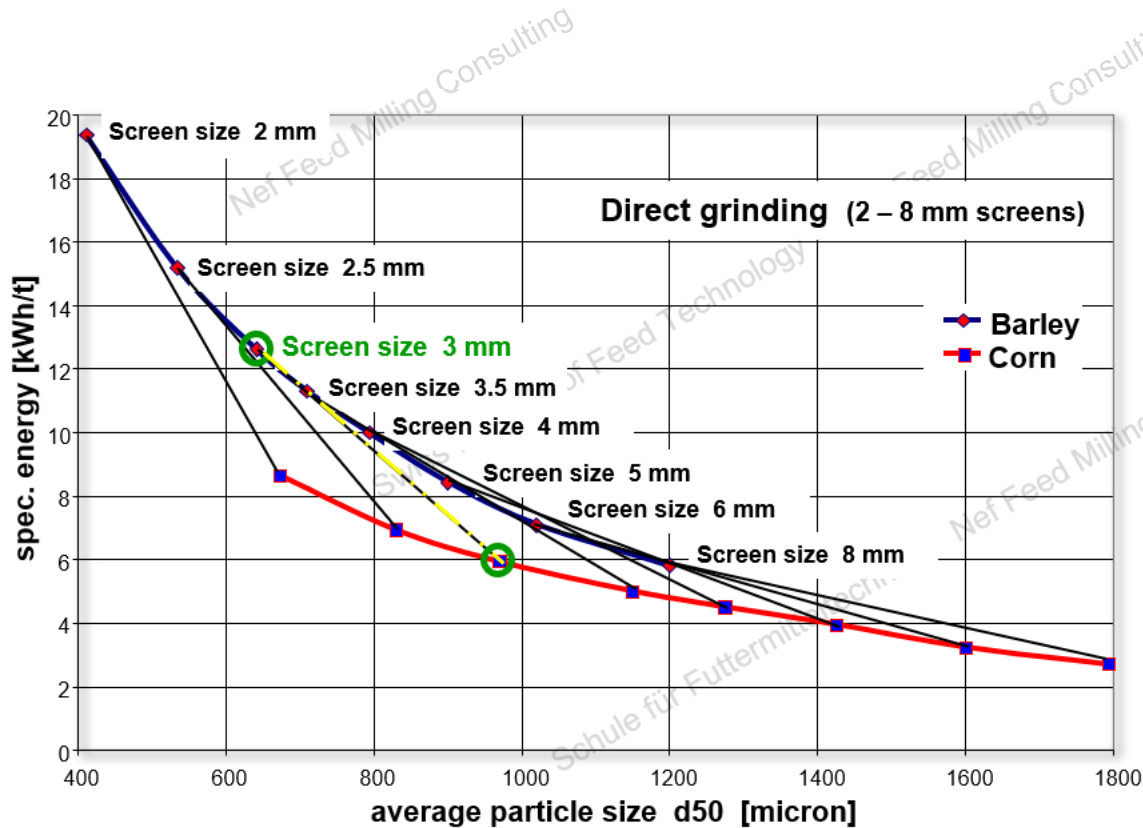
## Bin allocation of the raw materials

- ◆ **Size and number of bins available.**  
*Bin outlet configuration, Type of dosing element.*
- ◆ **Size of batch scale.**  
*Smallest component  $\geq 4\%$  of scale capacity.*

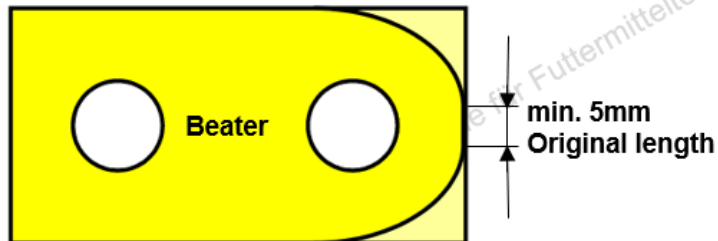
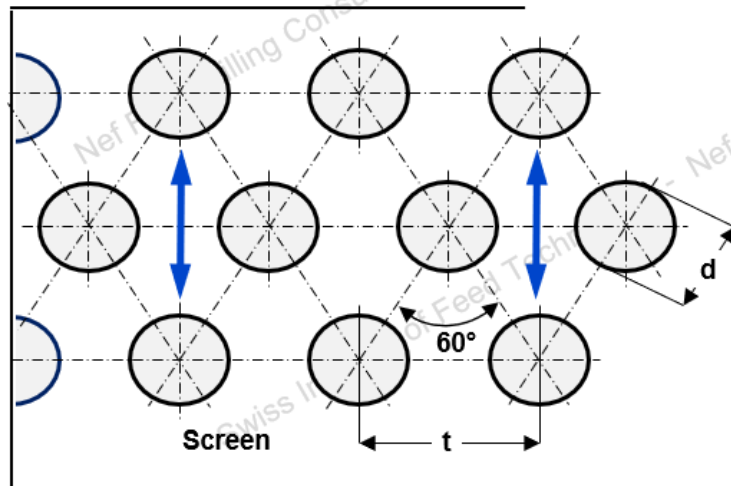
## Maintaining dosing and weighing accuracy

- ◆ **High and low bulk density products behave different.**  
*Risk of under and over weights.*
- ◆ **Frequent over weights result in ....**  
*.... waste of raw material.*  
*.... falsification of the formulation.*
- ◆ **Adjustment of bin and scale parameters required.**  
*Fine dosing weight/time, Pre cut-off point.*

# Size reduction – the basis for a successful pelleting process



- **Obtaining the required average particle size (d50)**
  - ◆ *Different raw materials are different to grind. Fibre, fat, moisture content, JKW-factor.*
  - ◆ *Impact on ....*
    - .... *energy consumption (kWh/t) or capacity (t/h).*
    - .... *average particle size distribution (d50).*
  - ◆ *Economical optimum.*  
*d50 = 600 – 800 microns.*
- **Optimizing possibilities**
  - ◆ *Frequent screen changes (manual / automatic).*  
*Labour intensive, Down times, Flexibility limited.*
  - ◆ *Main motor with variable speed drive (VSD).*  
*Highest flexibility, Energy saving, No time losses.*



## Screen configuration

- ◆ *60° hole arrangement.*
- ◆ *30 – 50 % open screen area.*

## Aspiration system hammer mill

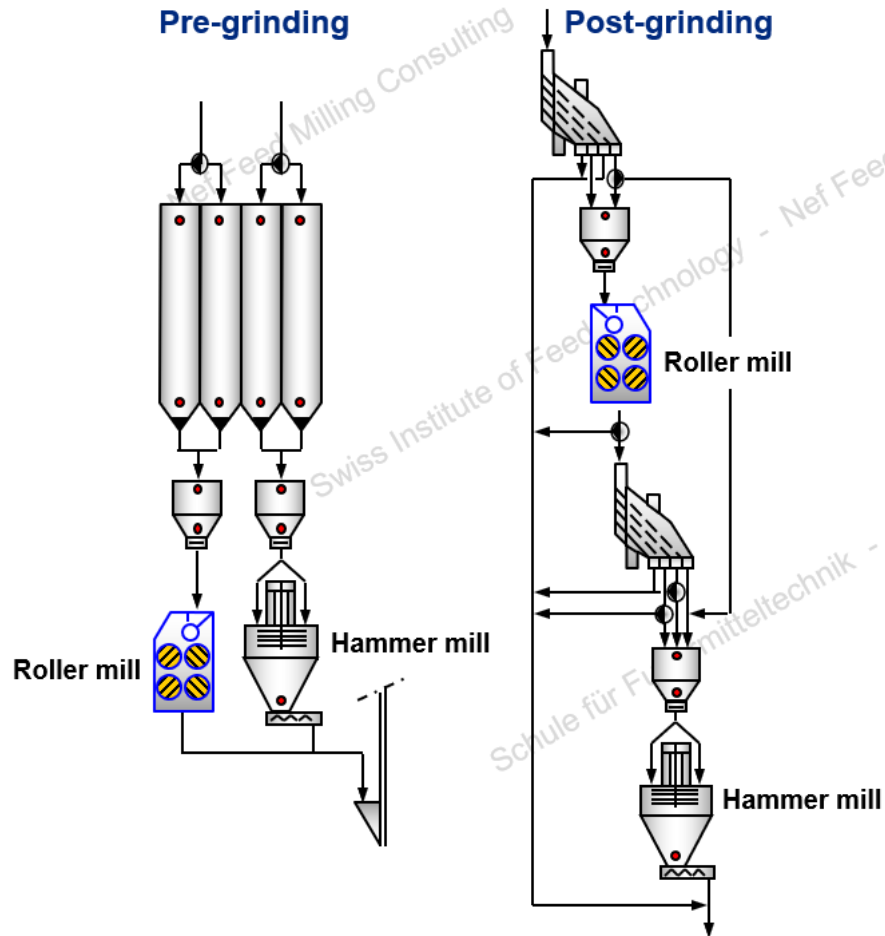
- ◆ *Sufficient air volume.*
- ◆ *Purging system filter bags.*
- ◆ *Differential pressure gauge.*
- ◆ *Avoid long duct works.*

## Wear & tear of beaters and wearing plates

- ◆ *Impact on ....*
  - .... *energy consumption (kWh/t) or capacity (t/h).*
  - .... *heat increment.*
  - .... *average particle size distribution (d50).*
- ◆ *Comparison energy cost with spare part cost.*



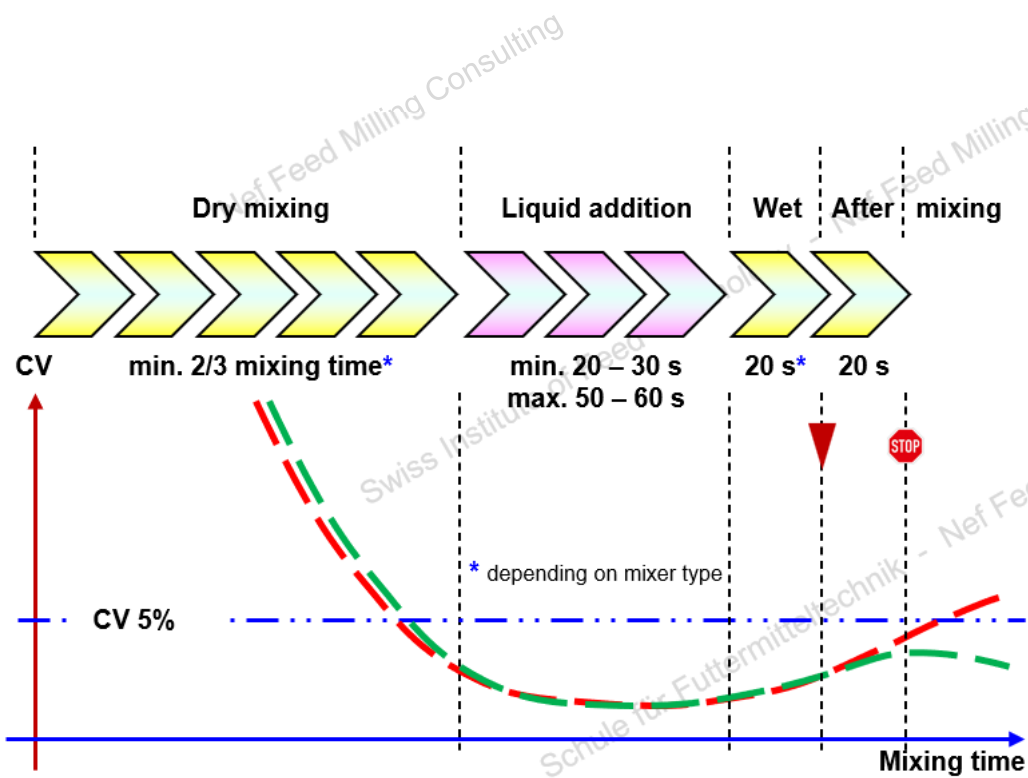
# Size reduction – potentials for energy savings



## Application of roller mills

- ◆ *In pre- and post grinding plants.*
- ◆ *More uniform particle size distribution.*
- ◆ *Up to 30% energy savings.*
- ◆ *More gentle treatment.  
Less heat generation, Less moisture loss.*
- ◆ *Particle size limited at the entrance.*

# Mixing / liquid addition – excellent homogeneity within shortest time



## Mixing accuracy affected by raw material properties

- ◆ *The more similar ingredients are ... the better the mixing accuracy/stability.*
- ◆ *Bulk density determines size of the batch.*  
**Batch size (kg) =**  
*Mixer capacity (dm<sup>3</sup>) x Bulk density (kg/dm<sup>3</sup>).*

## Liquid addition into the batch mixer

- ◆ *To compensate raw material shortage on ...*  
*... Moisture, Energy, Protein, Others.*

## Target of the mixing process

- ◆ *Coefficient of variation (CV) ≤ 5% ...*  
*... at a dilution of 1 : 100'000.*