

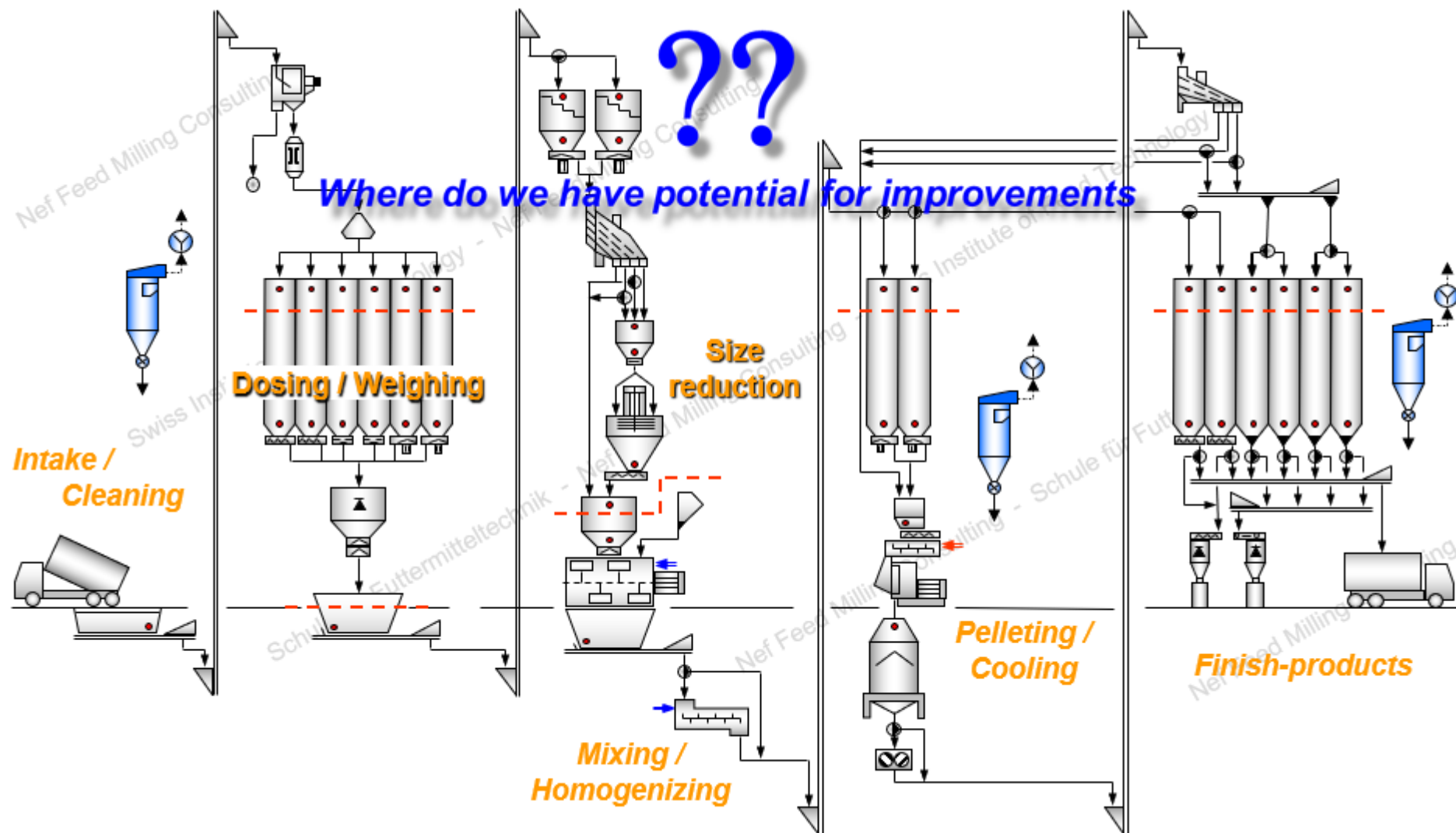
Optimizing Feedmill Efficiency for maximum performance.



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Basic plant layouts – Post-grinding.



State-of-the-art plant design and layout to optimize operational process.



Raw material reception.

- ◆ *Includes intake, cleaning, storage.*

✚ Intake capacity 3x capacity of mixing plant.

- ◆ *One shift operation only.*

✚ Delivery of macro ingredients in bulk trucks.

- ◆ *Fast & less labour intensive.*

✚ Well-designed size of intake pit.

- ◆ *One truck load should fit into pit.*

✚ Proper conditions for long term storage.

- ◆ *Temperature & moisture control.*

Mixing plant.

- ◆ *Includes dosing/weighing, mixing/homogenizing.*

✚ Max. number of batches/hour (common 10 - 15).

- ◆ *Minimizing idle times in batching process.*

✚ Correct number & size of batch-scales.

- ◆ *Upper limit 6 – 8 components per scale.*

✚ Use of micro-dosing units for micro ingredients.

- ◆ *Minimizing time consuming hand additions.*

State-of-the-art plant design and layout to optimize operational process.

Size reduction & Conditioning/Pelleting.

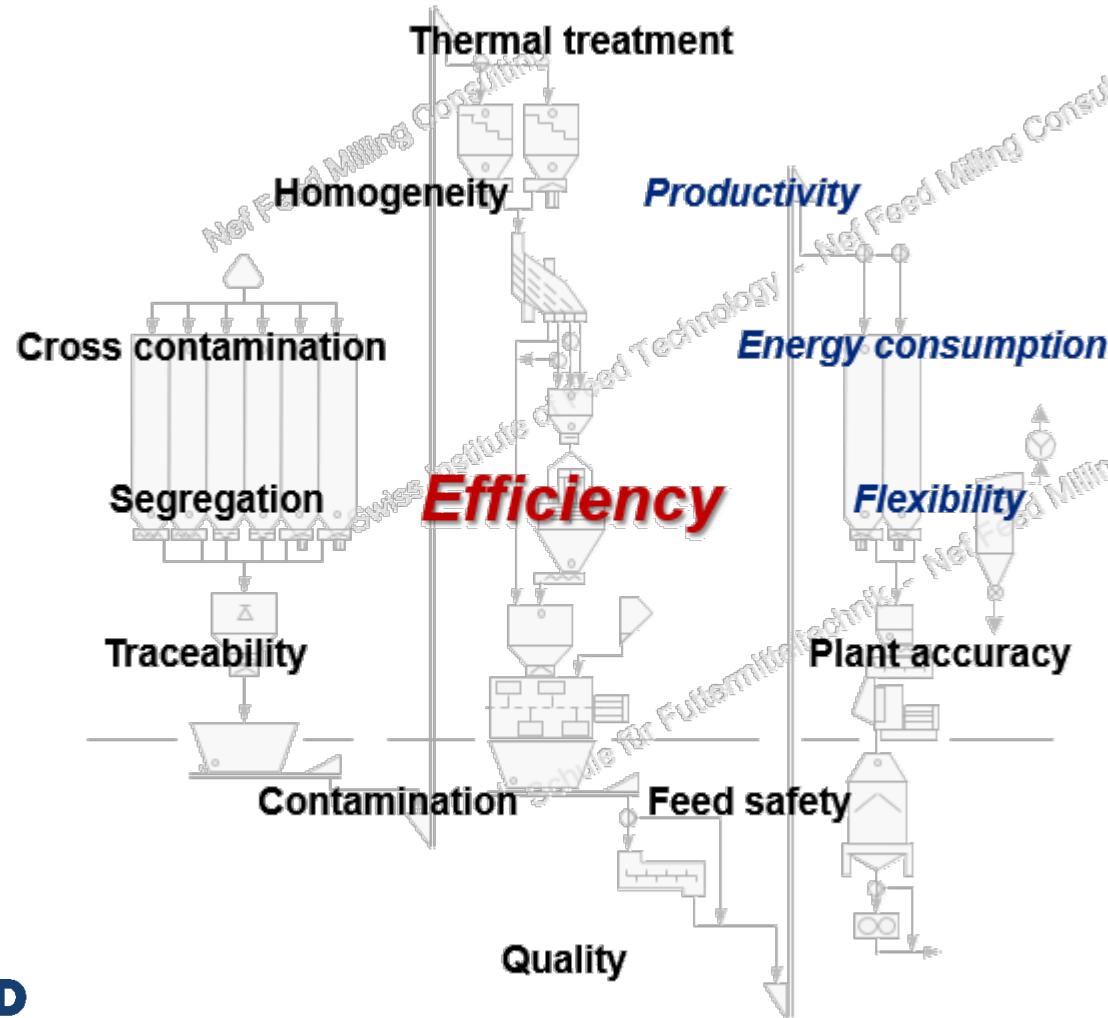


- ✚ Are the largest energy consumer in the plant.
 - ◆ *Selection of adequate equipment required.*
 - ◆ *Set-up & maintenance extremely important.*
- ✚ More on this processes later.

Finished products.

- ✚ Bagging and/or bulk dispatch.
 - ◆ *Minimizing of labour costs.*
 - ◆ *Use of automatic bagging units.*
 - ◆ *Use of robots in palletizing section.*

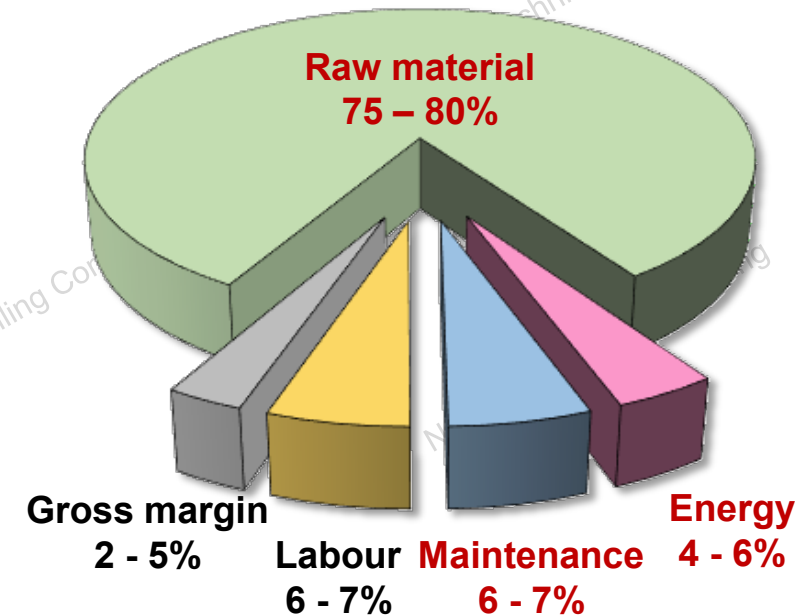
Subjects which the Feed Milling Industry is concerned about.



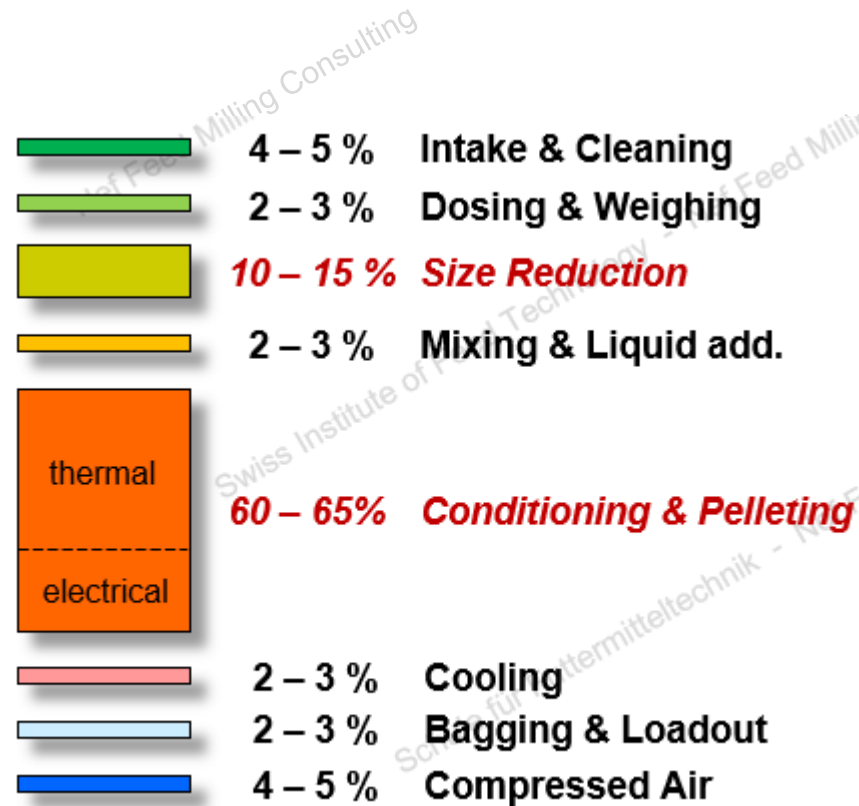
Efficiency in the Feed Milling Industry

- ♦ *producing maximum quantity of high quality feeds at lowest production cost.*

Cost drivers in animal feed production (estimated)



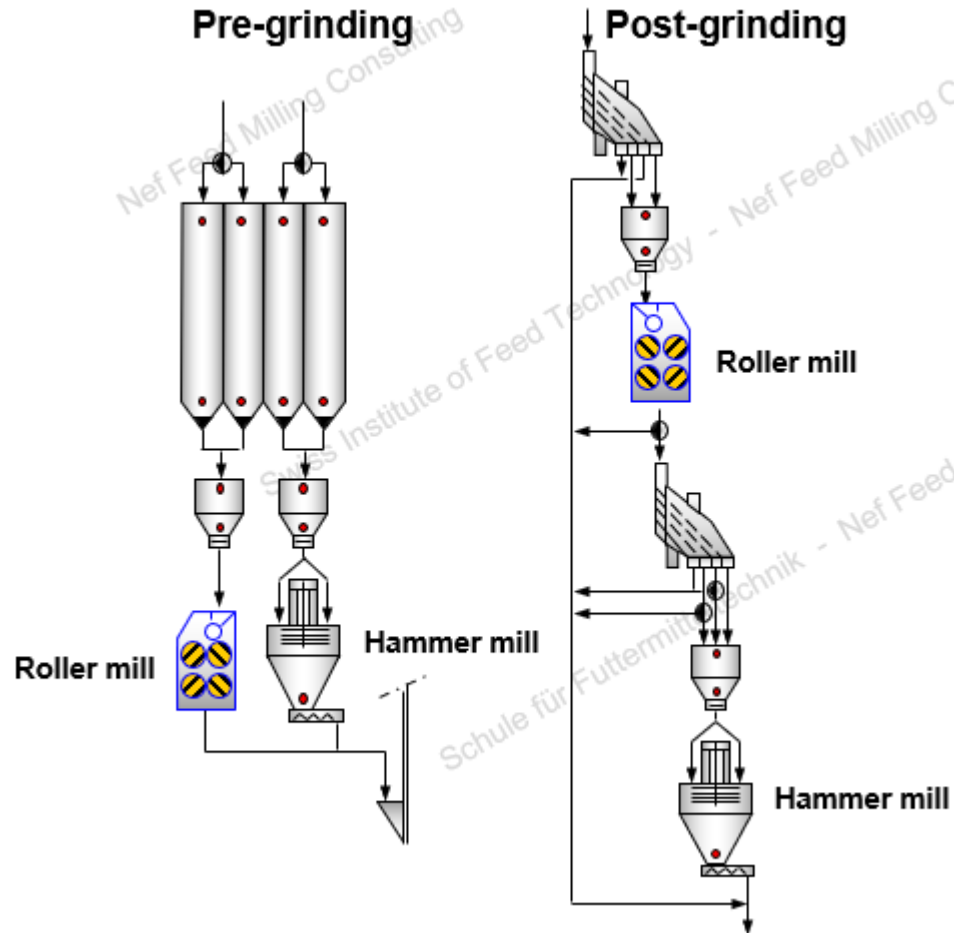
Energy consumption (kWh/t) in the individual process section in %.



➤ 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.

Size reduction – Potentials for energy savings.



Application of roller mills

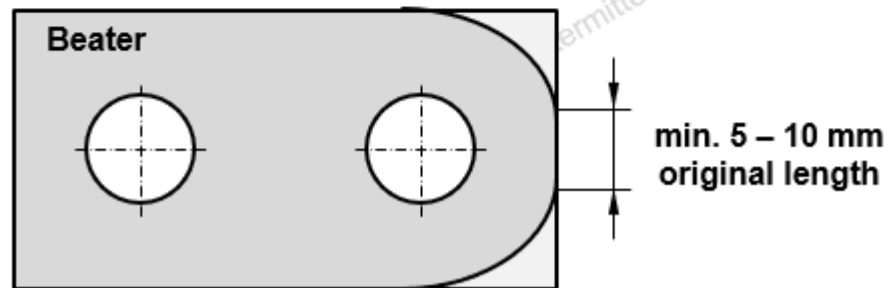
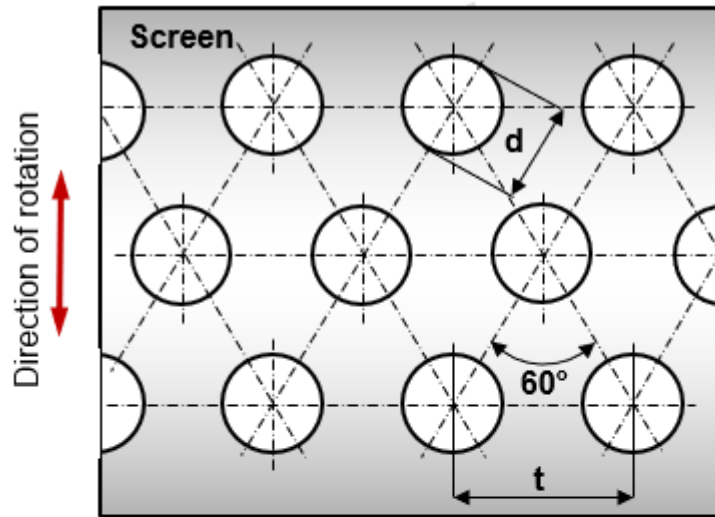
- ◆ *In pre- and post-grinding plants.*
- ◆ *More uniform particle size distribution.*
- ◆ *Up to 30% energy savings.*
- ◆ *More gentle treatment.
Less heat generation, Less moisture loss.*
- ◆ *Particle size limited at the entrance.*



Optimizing possibilities at hammer mills

- ◆ *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.*

Size reduction – Potentials for energy savings by maintenance.



Screen configuration

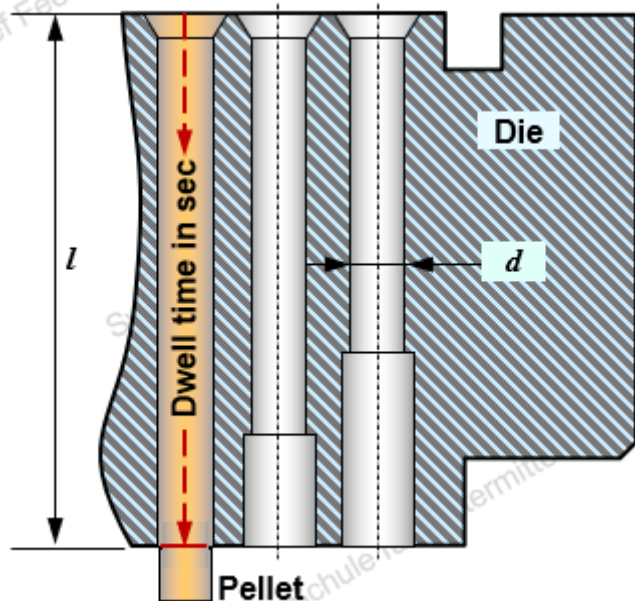
- ◆ *60° hole arrangement.*
- ◆ *30 – 50 % open screen area.*

Aspiration system for horizontal hammer mill

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

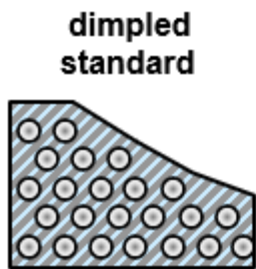
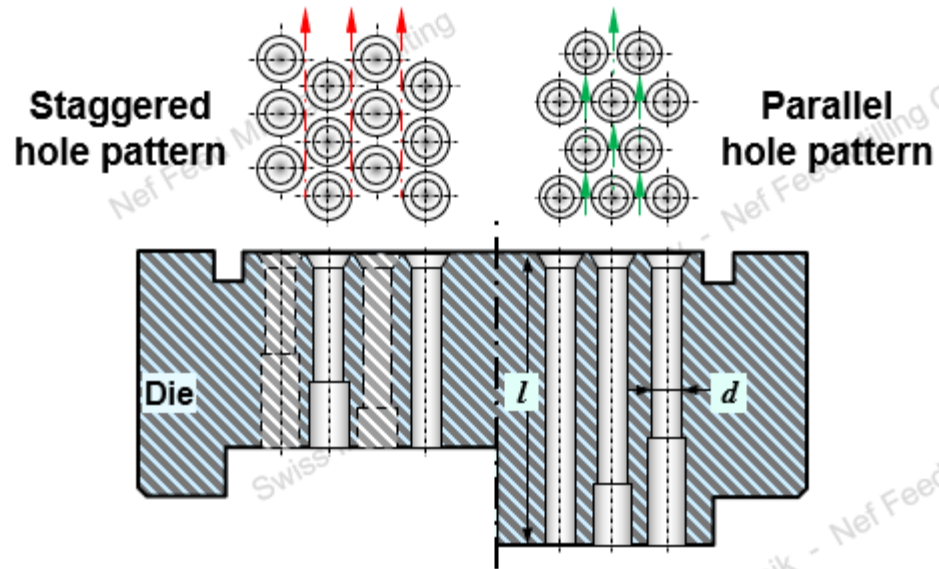
Wear & tear of beaters and wearing plates

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

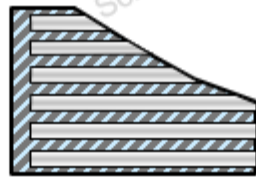


- Die configuration – dwell time in die hole
 - ◆ *Dwell time - a crucial parameter influenced by*
 - volume of the die hole.
 - number of die holes.
 - throughput of pellet mill.
 - ◆ *Generally, applies*
 - the longer the dwell time in the die hole
 - the better the pellet quality.
 - Common dwell times **around 3 – 5 sec.**
 - ◆ *Application of automatic roll gap adjustment*
 - intensive pre-compaction.
 - simulation of die thickness.
 - Improvement in pellet quality.

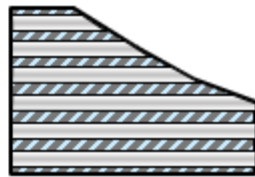
Pelleting – Potentials for quality improvements and energy savings.



Press roll shells
grooved closed end



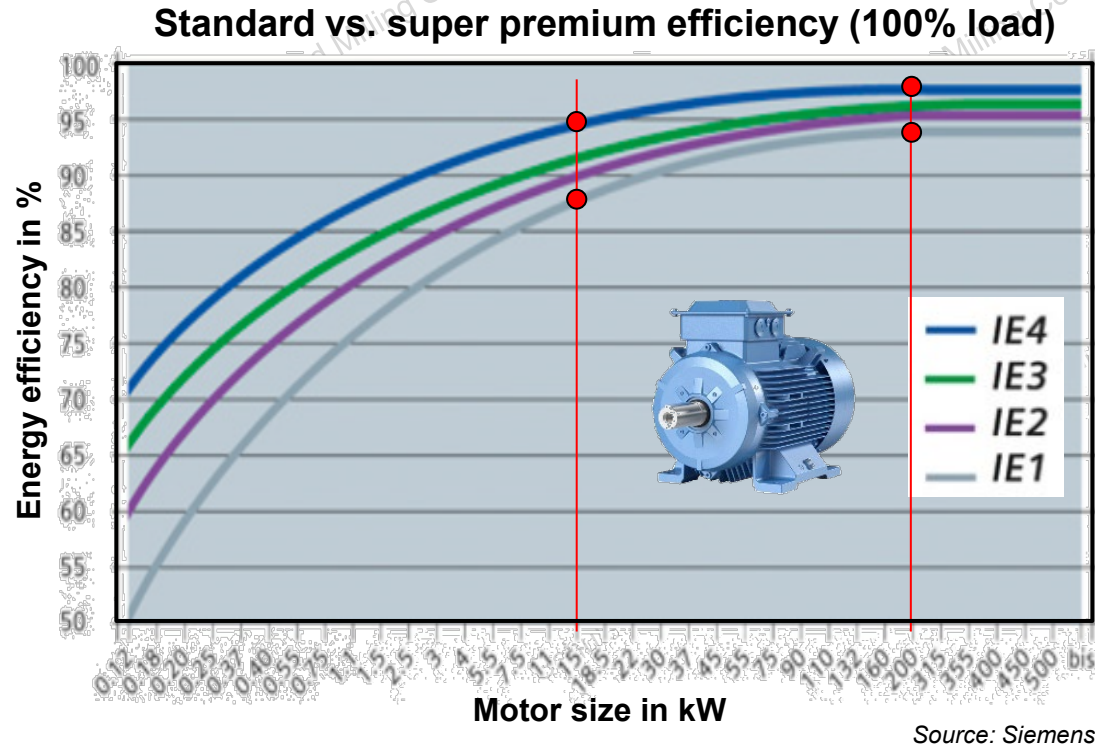
grooved open end



Optimizing the pelleting process.

- ◆ **Die configuration.**
 - Die hole diameter (d) & length (l).
 - Compression ratio (d/l) 1:10 – 1:15 ideal.
 - Manufacturing method – hole arrangement.
 - Die hole condition.
- ◆ **Press roll configuration.**
 - Diameter large as possible.
 - Shape and wear of roll shell surface.
 - Product distribution to die surface.
- ◆ **Automatic process control.**
 - Set values in average higher & constant.
 - Energy savings of 5 – 10% feasible.

Motor efficiency levels (IE) – Potentials for efficiency improvements.



Efficiency classes for low voltage AC motors.
(defined by IEC/EN 60034-30 / 2014)

- ◆ **IE4 Super-Premium efficiency.**
- ◆ **IE3 Premium efficiency.**
- ◆ **IE2 High efficiency.**
- ◆ **IE1 Standard efficiency.**

Compulsory efficiency levels by 1st January 2017.

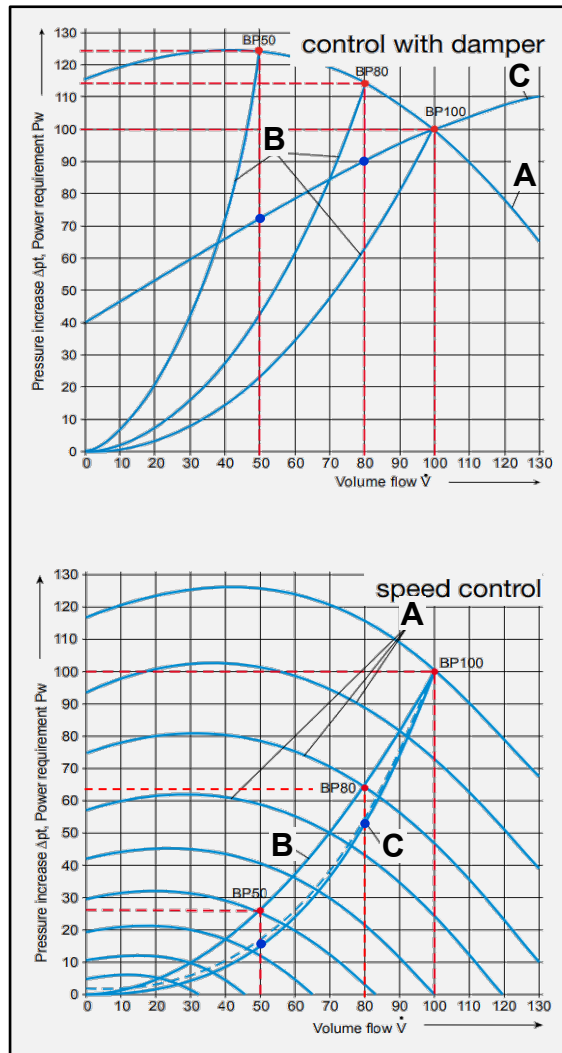
- ◆ **Direct driven motors must be min. IE3 level.**
- ◆ **VSD driven motors must be at least IE2 level.**

Replacement of motors with IE1 & IE2 levels.

- ◆ **IE3 & IE4 levels better stability under partial load.**
- ◆ **Savings with a 15 kW motor up to 8%.**

Contact your motor supplier!!

Air volume control by variable speed drives – Potential for energy savings.



A = Fan performance line
B = Plant performance line
C = Power consumption

Source: Reitz Group

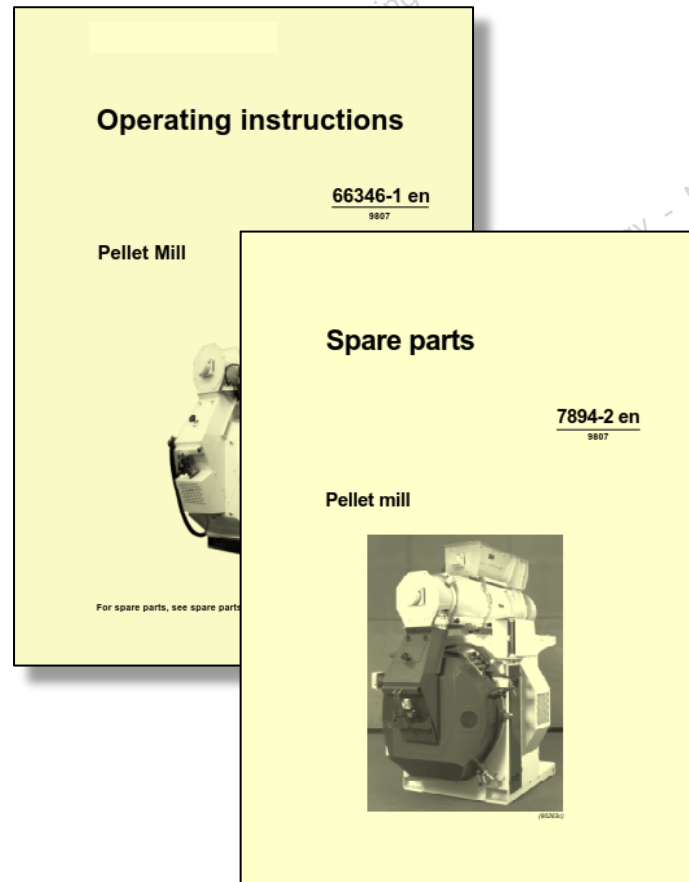
✚ Air volume control of a fan, air damper versus VSD

- ◆ **Better performance of large fan motors with VSD. Energy savings of 20 – 40% possible. No efficiency losses.**
- ◆ **Change of fan speed, results in linear change of air volume.**

✚ Typical application areas

- ◆ **Cooler fan in pelleting lines.**
- ◆ **Compressors in compressed air systems.**
- ◆ **Pumps in liquid addition systems.**
- ◆ **Combustion-air fan at steam boilers.**

Proper maintenance a contribution to save production cost.



- ✚ Break down or preventive maintenance ...??
The latter is the more economical solution.
- ✚ Establish a maintenance program with the aid of the equipment supplier's manual.
 - ◆ **Maintenance software program.**
- ✚ Execute any maintenance work seriously and with the aid of the equipment supplier's manual.
- ✚ Recording service life of wearing parts which need to be replaced in regular intervals e.g.
 - ◆ **Hammer mills** >> **beaters, screens, etc.**
 - ◆ **Pellet mills** >> **dies, rolls, shear pins, etc.**
 - ◆ **Chain conveyor** >> **rubber scrapers.**
- ✚ Stock keeping of critical spare and wear parts.
Ensure the use of original or equivalent part.
- ✚ Regular maintenance of boiler and steam line.
Supply of good quality steam is essential.
- ✚ Keep down times short as possible.



Efficiency in the Feed Milling Industry

- ◆ *producing maximum quantity of high quality feeds at lowest production cost.*
- ◆ *Therefore, process need to be optimized in such a way*
 - to maintain quality requirements, like Particle size, Homogeneity, Hygiene, Durability etc.*
 - to reduce production cost at the same time, in Energy, Maintenance, Down & Idle times etc.*
- ◆ *Plant efficiency can be measured by the OEE.*