FEED TECHNO VISION 2022

Selko®

Optimizing process technology in times of Grain and Energy scarcity

Part 2

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trouw nutrition
a Nutreco company

Compacting – a refining process of the homogenously mixed mash

- **Raw material / mash (55 – 65%)**
  - *Physical characteristics*
  - *Chemical characteristics*
  - *Preparation of mash*
  - *Pelleting aids*
- **Process control (15 – 20%)**
  - *Steam conditioning*
  - *Throughput regulation*
  - *Moisture control*
  - *Fine returns*
- **Machine / Pellet mill (15 – 20%)**
  - *Die circumferential speed*
  - *Die configuration*
  - *Roll configuration*
  - *Roll gap adjustment*

→ ***Behaviour in pelleting*** →

Pellet quality
Stability / Durability
Energy consumption

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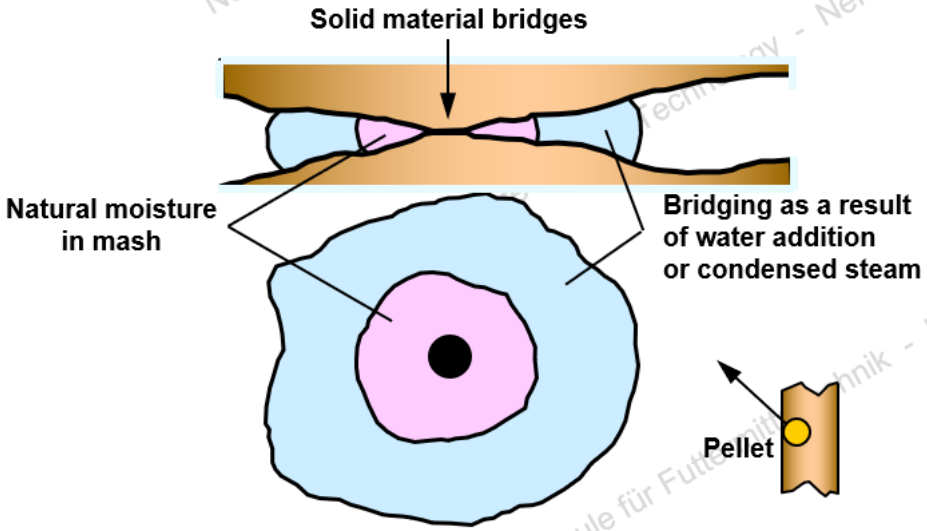
Compacting – a refining process of the homogenously mixed mash



- **Steam Conditioning – introducing heat and moisture**
  - ***Change of physical and chemical characteristics. Plasticizing solid particles, Creation of liquid bridges, Partial starch modification, Moisture balance.***
  - ***Generally applies … The higher the conditioning temperature the better the quality, the lower the specific energy.***

    Limited at around 80 – 85°C. Max. moisture content, Destruction of nutrients.
  - ***Utilizing slightly superheated steam. 5 – 10°C above saturated steam temperature.***

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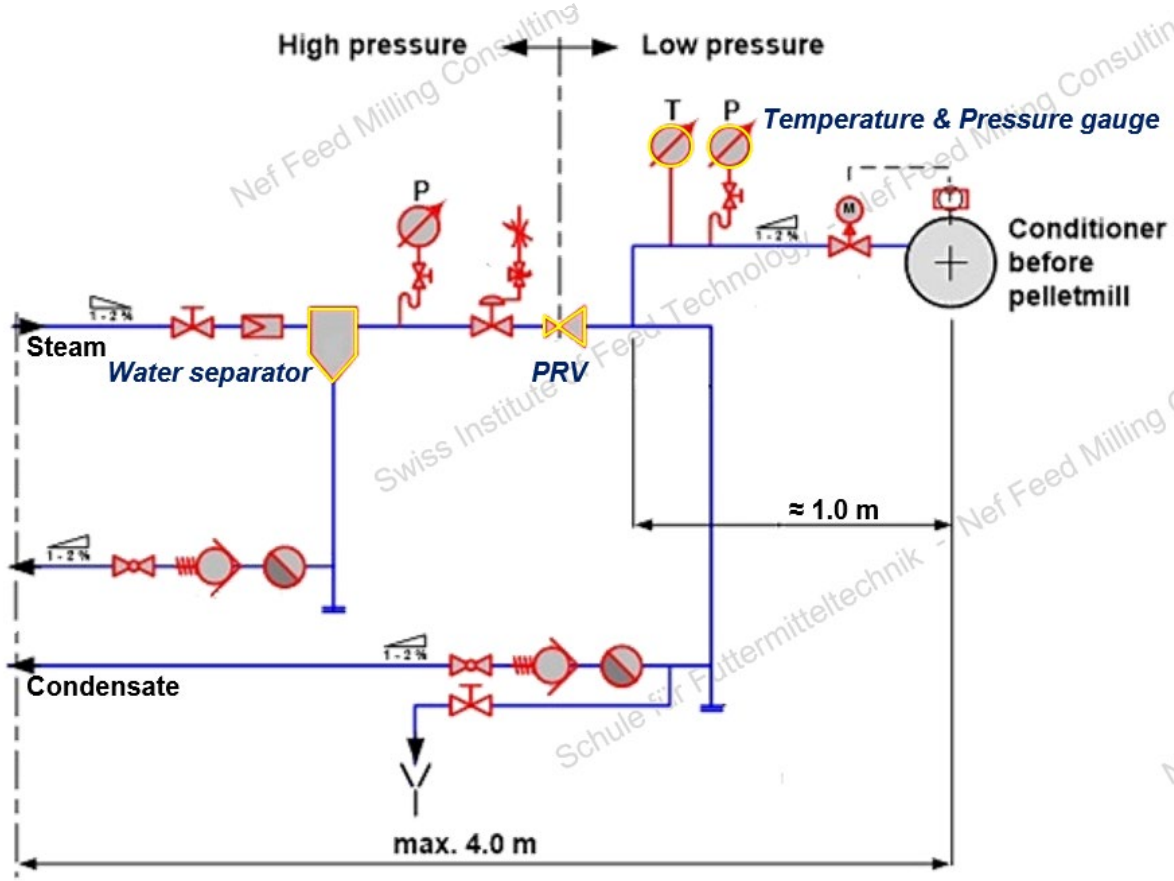

- **Steam Installation – crucial fittings to consider**
  - *Steam supply from boiler 7 – 9 barG*
  - *First steam drying step.*
    Mechanical water separation.
  - *Second steam drying step.*
    Pressure reduction (PRV).
  - *Steam temperature at a given pressure, provides information about steam quality.*
  - *Insulated steam lines*

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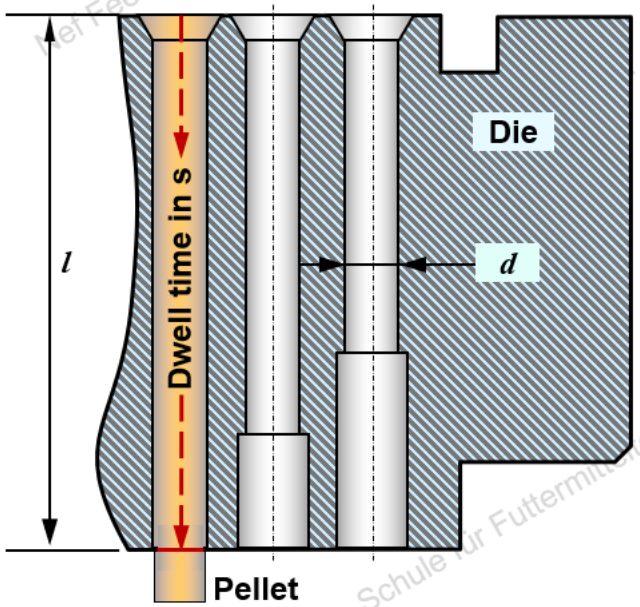

- **Die configuration – dwell time in die hole**
  - ***Dwell time - a crucial parameter influenced by ….***
    …. number of die holes.
    …. volume of the die hole.
    …. throughput of pellet mill.
  - ***Generally applies …***
    The higher the dwell time in the die hole
    the better the pellet quality.

    Common dwell times around 3 – 5 sec.
  - ***Application of automatic roll gap adjustment.***
    Intensive pre-compaction, simulation of die thickness.

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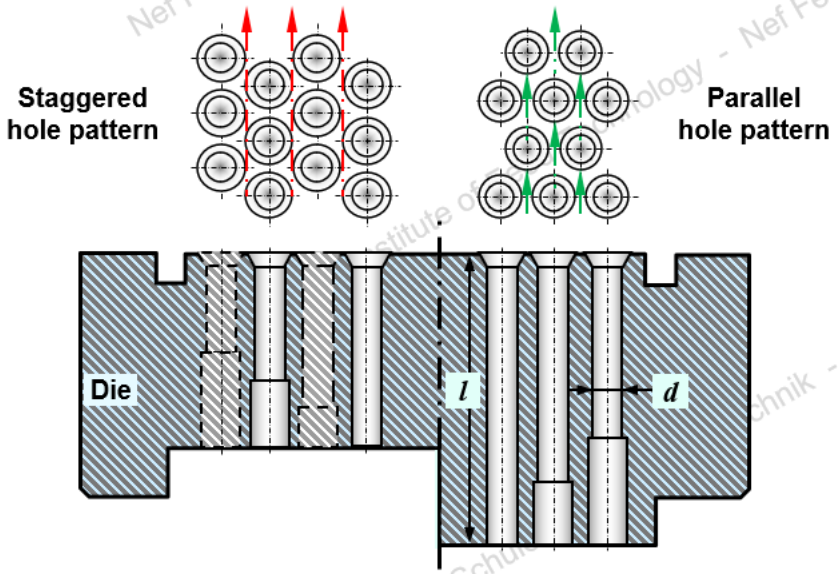
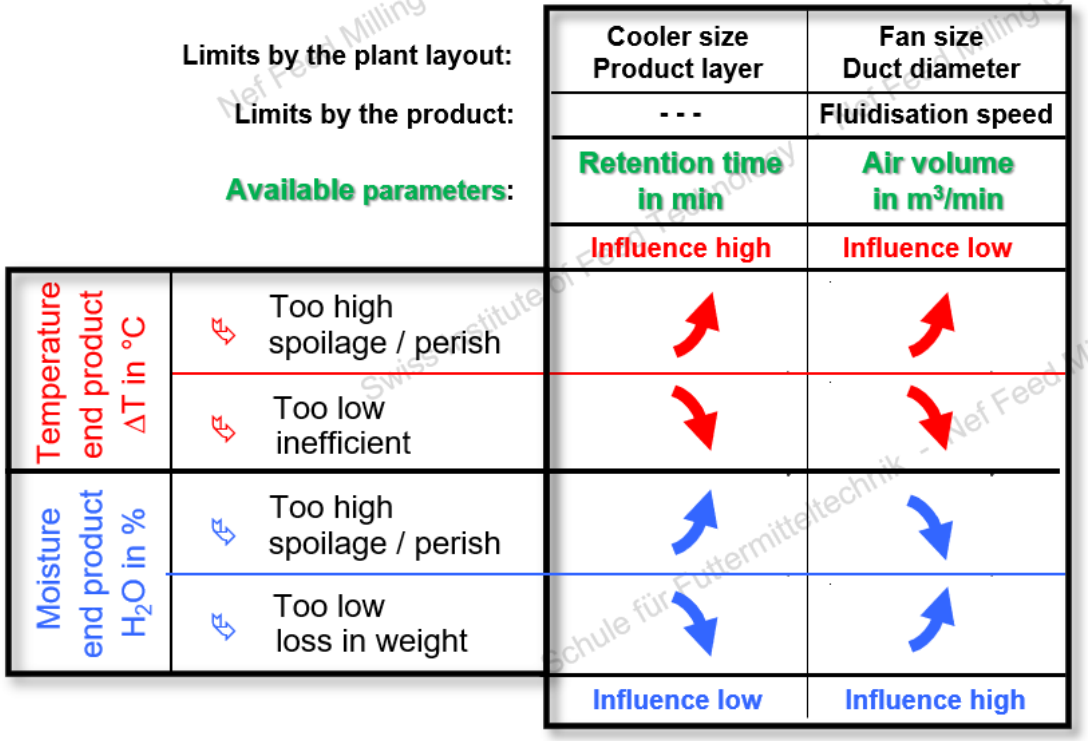


- **Optimizing the pelleting process.**
  - ***Die configuration.***
    Die hole diameter (d) & length (l).
    Compression ratio (d/l) 1:10 – 1:15 ideal.
    Manufacturing method – hole arrangement.
    Die hole condition.
  - ***Press roll configuration.***
    Diameter large as possible.
    Shape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

Cooling & drying – for a safe and trouble-free storage



		Cooler size Product layer	Fan size Duct diameter
Limits by the plant layout:			
Limits by the product:		- - -	Fluidisation speed
Available parameters:		Retention time in min	Air volume in m³/min
		Influence high	Influence low
Temperature end product ΔT in °C	Too high spoilage / perish	↑	↑
	Too low inefficient	↓	↓
Moisture end product H_2O in %	Too high spoilage / perish	↑	↓
	Too low loss in weight	↓	↑
		Influence low	Influence high

- **Cooling & Drying of pellets with changing properties**
  - *Adjustment of air volume and retention time.*
    Pellet diameter, Product properties.
  - *Retention time – adjust height of product layer by ….*
    …. moving the level probe (manual ..?).
    …. locating cooler on load cells (online).
  - *Air volume – adjust exhaust air system by ….*
    …. positioning of butterfly valve (manual ..?).
    …. fan motor with variable speed drive VSD (online).
- **Target of the cooling & drying process**
  - *Product temperature 5 – 10°C above ambient.*
  - *Product moisture 12 – 14% H_2O ….*
    …. at lowest energy consumption.

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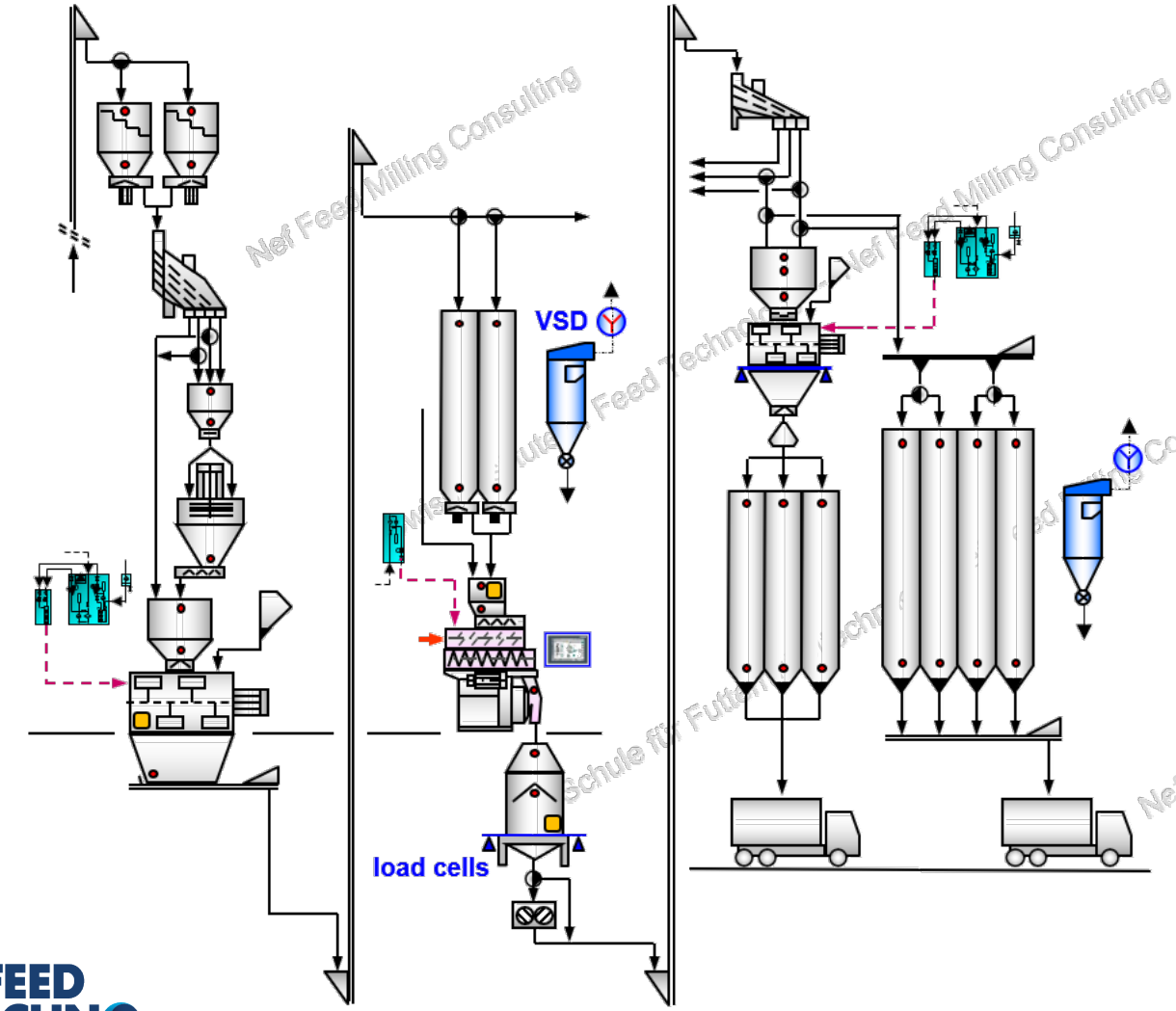
Moisture management – online control improving quality and efficiency



- **Compensation of moisture fluctuations in raw material**
  - *Constant moisture content at the pelleting process.*
    Good and constant pellet quality.
    Lower in energy consumption.
    Higher availability of pellet mill.
    Less product spoilage / mould formation.
- *NIR or Microwave and Temperature sensor.*
- *Addition of water, possibly combined with additives (Mould inhibitors / Surfactants etc. ...??).*

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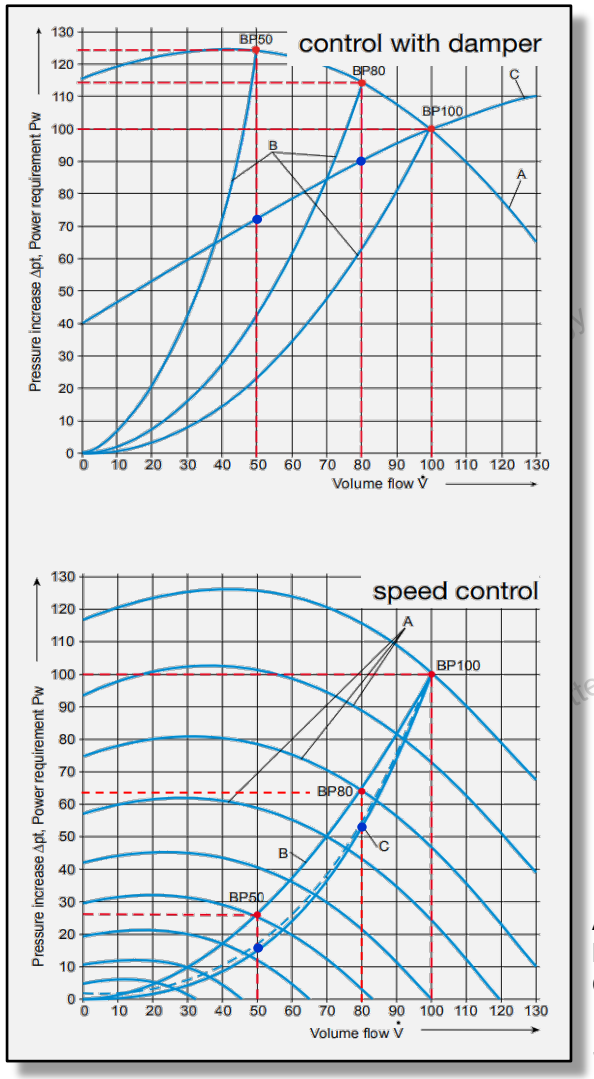
Variable Speed Drives (VSD) – Potentials for efficiency improvement



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.***

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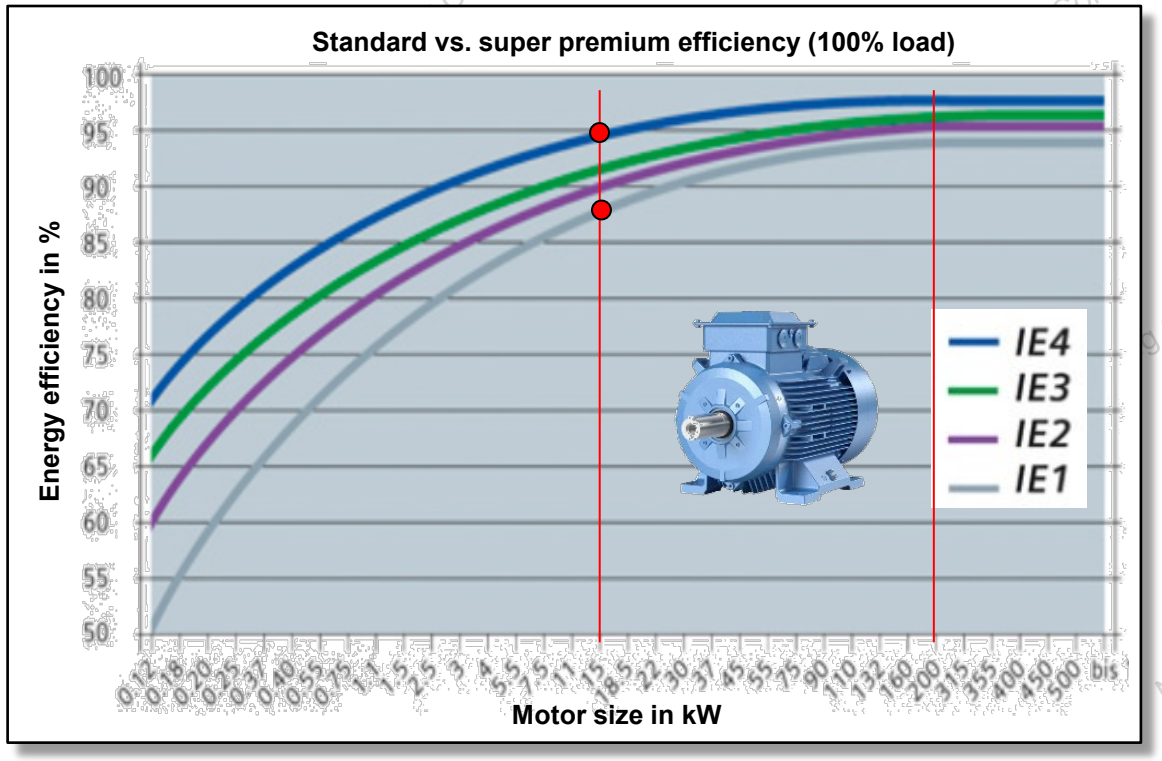
Motor efficiency levels (IE) – Potentials for efficiency improvement



Source: Siemens

- **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!!**

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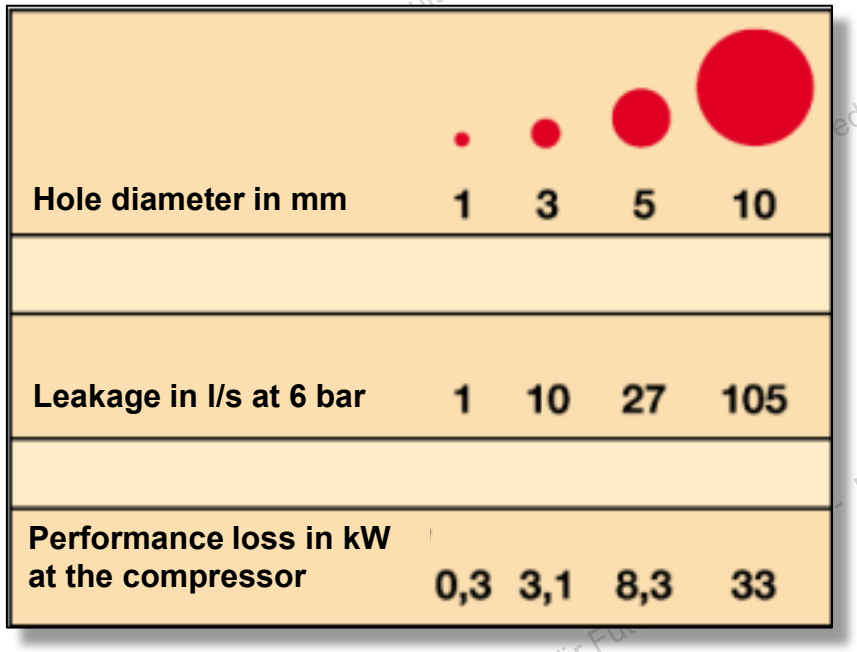
Compressed air leakages – an underestimated cost driver



Hole diameter in mm	1	3	5	10
Leakage in l/s at 6 bar	1	10	27	105
Performance loss in kW at the compressor	0,3	3,1	8,3	33

20 “small” leakages each of 1.0 mm:

20 x 0.3 kW x 8760 hours/year = 52’560 kWh/year

52’560 kWh/year x 0.12 €/kwh = 6’307 €/year

Source: Atlas Copco

- **Compressed air systems**
  - ***Keep pressures as low as possible.***
    Reduction of 1 bar = energy savings of 5 – 6%.
  - ***Application of VSD controlled compressors.***
    Energy savings of 20 – 40% possible.
  - ***Possibly recovery of energy.***
    Heating of rooms or water ..??
  - ***Find leakages & eliminate them.***
    Small leakages are cost effective.
- **Proper adjustment of plant equipment**
  - ***Aspiration bag filters.***
    Pulse interval & pulse length.