Global Trends in Feed Industry

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Serving the Feed and Oil industries.

- Technology leadership
- Reliable machinery
- Vast engineering experience
- Extensive customer service
- Full automation control
- Training and support

Poultry Feed

Aqua Feed

Oilseed Preparation

Cattle Feed

Premix & Concentrates
Main drivers of the global feed market.

- Population Growth
  - 35% world population growth 2015 – 2030

- Changing Eating Habits
  - 40% per capita meat consumption 2000 – 2030

… are the power fuel for our business.
The world’s excessive appetite for meat and other animal proteins fuels our business.

Global demand for meat per animal type (in tons, 2005-50)

Growth in all animal segments
Three major trends transforming the industry.

Animal Nutrition & Sustainability

Feed Conversion Ratios

- 1:6
- 1:3
- 1:1.5

Changes in genetics of species
- Nutritional advice
- Particle granulation, etc.
- Less antibiotics needed

Feed Safety

- Anti microbial resistance
  - Validated hygienization
  - Mycotoxin reduction
  - Feed safe design

Internet of Things

- Master efficiency and quality
  - Traceability
  - Online data clustering
  - Self regulating production
Animal Nutrition & Sustainability.

**Feed Conversion Ratios**
- 1:6
- 1:3
- 1:1.5

Changes in genetics of species:
- Nutritional advice
- Particle granulation, etc.

- Two Stage Grinding
- Particle Size Measurement
- Multi-NIR Inline System
Two stage grinding.
Influencing particle size to increase FCR.

Example parameters
- Broiler feed, corn/wheat base
- Plant capacity: 50 t/h
- d50 = 630 micron

Energy consumption
- Direct grinding hammer mill:
  296 kW = 5.92 kWh/t
- 2-stage grinding
  213 kW = 4.26 kWh/t

28% energy savings
(1.66 kWh per ton)

1. Pre-screening, fraction 2.0 mm, overs 89%
2. 1st grinding stage, 89% of 50 t/h = 44.5 t/h
   Roller mill, 1. gap: 2.0 mm, 2. gap: 1.5 mm
   Energy at JKW 50: 74 kW (2x 37)
3. Sizing, fraction 2.0 mm, overs 47%
4. 2nd grinding stage, 47% of 44.5 t/h = 20.9 t/h
   Hammer mill, screen 3.0 mm, 90 m/s
   Energy at JKW 50: 139 kW

Energy total = 4.26 kWh/t

Source: Experiential test of Swiss SFT Institute in feed lab.
Impact of particle size distribution on animal health and performance.

Pilot test conducted on three poultry farms / USA

Goal: determine optimal particle size distribution for poultry

Feed given to the animals:
- Coarse/textured feed (roller mill)
- Fine/non-textured feed (hammer mill)

Results for coarse/textured feed
- 20% higher weight of the muscular stomach (indicator of animal health)
- Lower mortality rate
- Slightly higher animal performance
Particle Size Measurement
Ensuring consistent quality & best utilization of raw materials.

→ Sampling at the mixer (homogeneous product)
→ Precise measurement (50 particle classes, high- and low-resolution channel)
Inline measurement of moisture, fat and protein

A Raw material intake

B Mixer

C Conditioner

D Cooler

Bühler Multi-NIR Inline

Scraper at the paddle helps to keep the sensor clean in case of extremely sticky products

Sensor should be covered with product completely while measuring
Benefits of moisture regulation alone…

- **Lean cost formulations**
  - Reduced “safety margin” of moisture content in formulation due to consistent measurements (± 0.3%)

- **Constant product quality**, **app. 5 % more line availability**
  - Continuous product quality, even in case of moisture fluctuations of raw materials
  - Increased line availability due to reduction of fines

- **Energy savings in pelleting process**
  - Reduction of Pellet-Mill SME by up to 10 % due to optimized moisture content

- **Product safety and traceability**
  - Continuous monitoring of moisture and fat content
  - Reporting function of stored data / Traceability

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**Typical ROI conservative assumptions**

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Line capacity</td>
<td>100'000 tons/year</td>
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<tr>
<td>Moisture increase</td>
<td>0.5%</td>
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<tr>
<td>Sales price feed</td>
<td>300 €/ton</td>
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<tr>
<td>Annual savings</td>
<td>150'000 €</td>
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<tr>
<td>Return on investment</td>
<td>&lt; 1 year</td>
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The Bühler Feed & Food Safety Initiative

Hygiene from plant, machine to operations

Mycotoxin: prevention & reduction

Process design, validation & monitoring

Know how and training
Examples of Bühler Food and Feed Safety solutions.

From hygienic design ...

... over system solutions for mycotoxin control......

...to inactivation technologies.

Kubex T Pellet Mill
up to 20 % less energy consumption and hygienic design

SORTEX Optical Sorting

HYMIX Plus Conditioning
100 % of the feed mash is heated to the set temperature prior fed to the pellet mill (salmonella, bacteria and mold reduction)
The challenge with Salmonella in feed and food

Salmonella: a bacteria that harms humans and animals
Raw material is contaminated with Salmonella
Salmonella can well survive in dry environment
Salmonella has to be inactivated in feed & food processing

Image: Janice Haney Carr, Center for Disease Control and Prevention, USA
The HYMIX Plus Conditioner inactivates Salmonella reliably.

- 100% of the feed mash is heated to the set temperature.
- 0% re-conditioning or dumping of insufficiently treated feed mash.

- Increased line capacity
- Faster start-up of pellet mill
Internet of Things is not a vision, it’s reality.

“A network of internet-connected objects able to collect and exchange data using embedded sensors.”

Device management
- Enable experts to remotely diagnose problems without user intervention.

Better decisions through data analytics
- User behavior data can be used to improve product design.
- Data history helps to predict necessary maintenance.
- Business processes can be optimized.

Self-regulating production
- Individualized products can be produced cost efficient.

Traceability
Everything under control – with Bühler’s IoT platform.
Better decisions, powered by smart data.

**Dashboards**
- Key performance indicators (KPI’s)
- Energy consumption
- Quality data
- Downtime

**Mobile Applications**
- Management information
- Maintenance support
- Plant operation

**Feed Safety**
- Product track and trace
- Logistic support
- CCP monitoring
- System collaboration (ERP / LIMS / Least cost formulation systems)
Resources become scarce as world population grows.

Protein sources in animal feed today

- Soybean meal: 60%
- Oilcrop meals: 28%
- Forages
- Fishmeal
- Pulses
- Others

Price of soybean and soybean meal over the years (1994-2014):

Availability of soybean across the world:

- Export
- Import

Global Trends in Feed Industry
Alternative raw materials will play a fundamental role in the future.

Insects are a promising protein source in feed and food.

- Insects can grow on organic residues, which are available all around the world.
- Farming insects needs less space.
- Insects are very nutritious for animals and humans.
The future is not predictable, but can be shaped!
Thank you for your attention!