



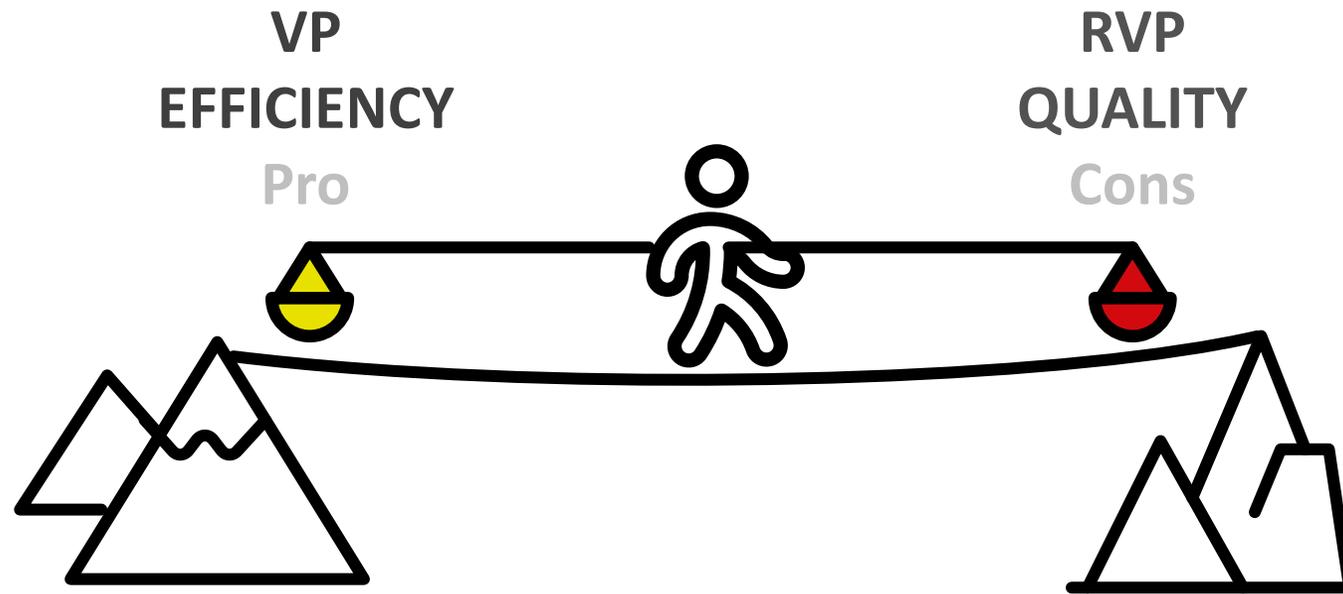
PARTNERS **IN**
PROGRESS

Feed mill efficiency and profitability in 2022

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Balancing on thin line



Current situation: Increasing cost of raw materials



Current situation: Increasing gas & energy costs

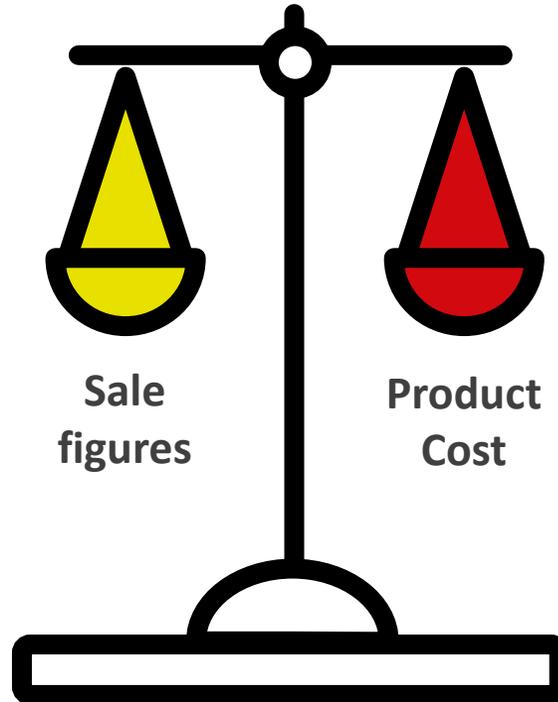


Add to the left or reduce weight on the right

Market situation

- Competitors
- Special addition
- Sales team number and skills

Lower impact



Feed production

- Energy
- Efficiency
- Quality
- Maintenance

Logistic

- In
- Out

Higher impact

Raw materials

- Storage
- Price
- Quality

What does this mean for feed producers?

Replacing feed ingredients to optimize costs

- Preserve feed material and feed quality
- Compensate for lost ingredients (protein content, digestibility)
- Compensate for stress caused by diet changes (animal efficiency is key for productivity)

Process optimization

- Energy costs
- Reduce losses
- Increase throughput

What are the major concerns of the feed millers?

Providing high quality of feed:

- Low mold and microbial counts
- High pellet stability
- Optimum moisture

High production efficiency

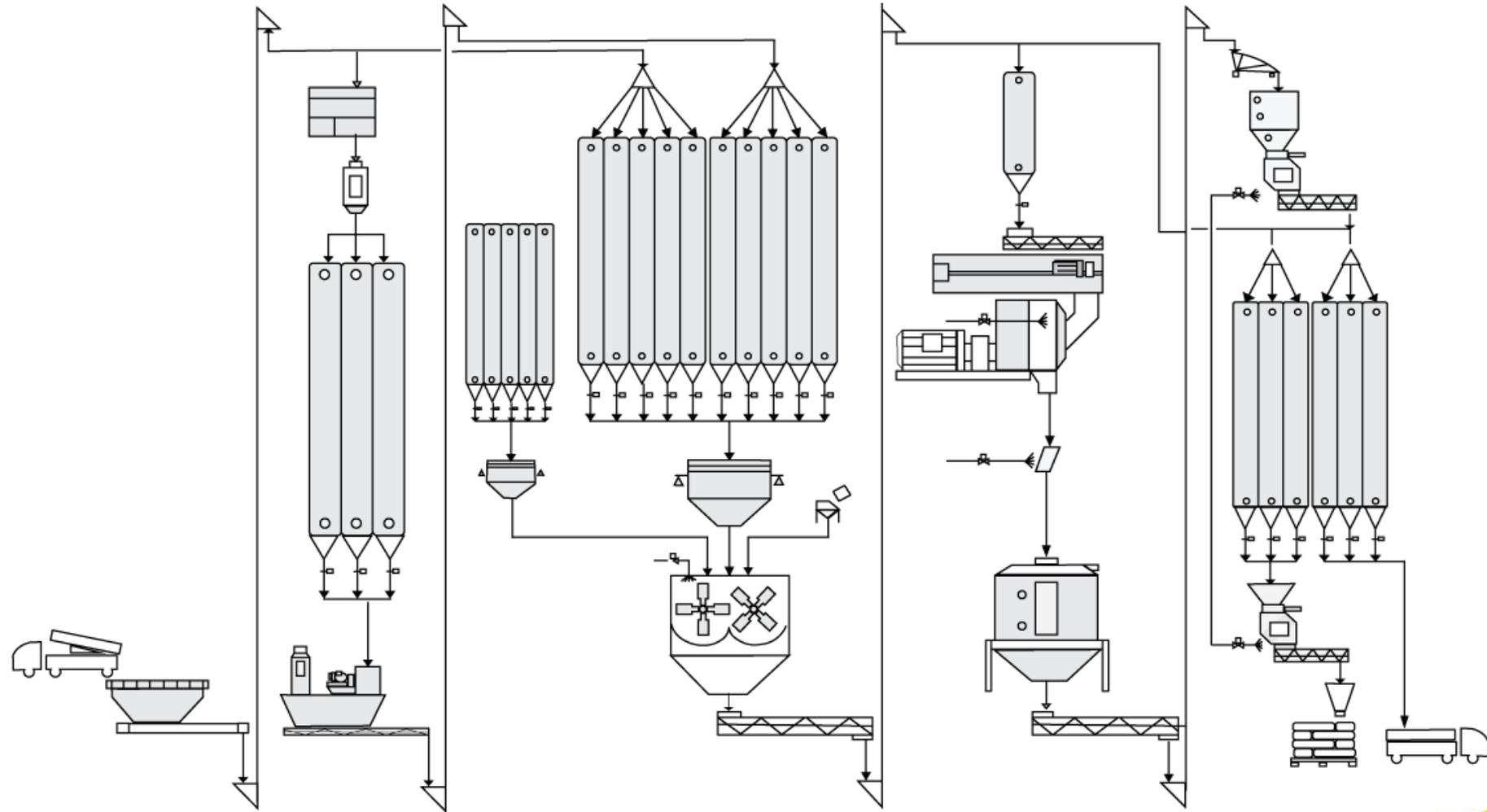
- High throughput per hour
- Low power consumption

Lower process loss

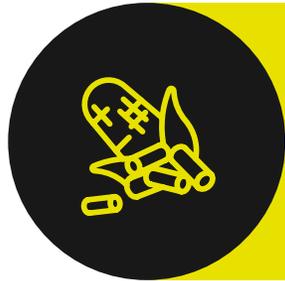
- Shrinkage management
- Fines in pelleted feeds



Feed mill diagram



Manufacturing vs. nutrition & feed safety



More ingredients
means more:

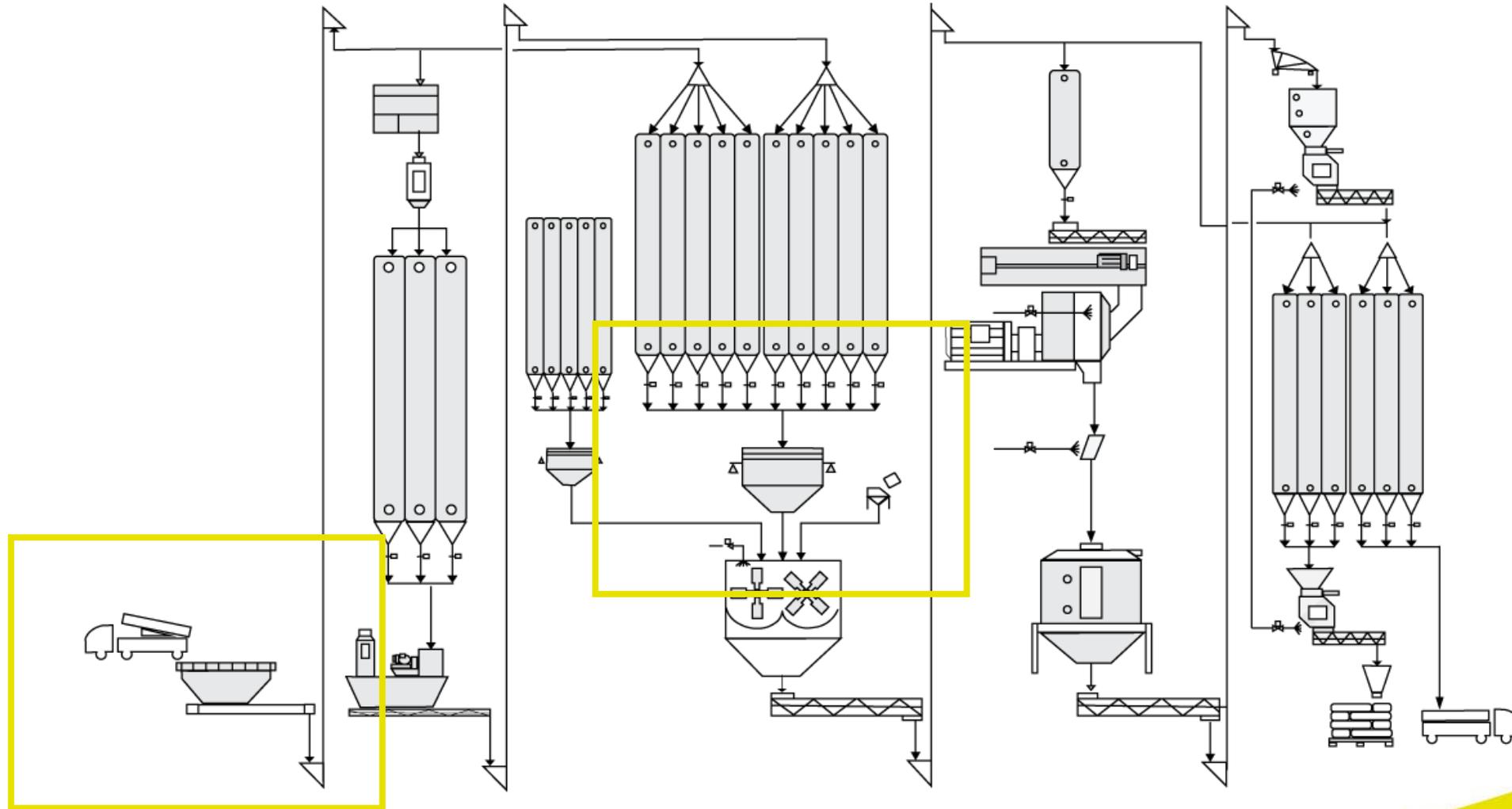
Nutritional options
Reconciliation
Shrink management



More
sampling/testing
means:

Greater control
Less performance & regulatory risk
More time & expense

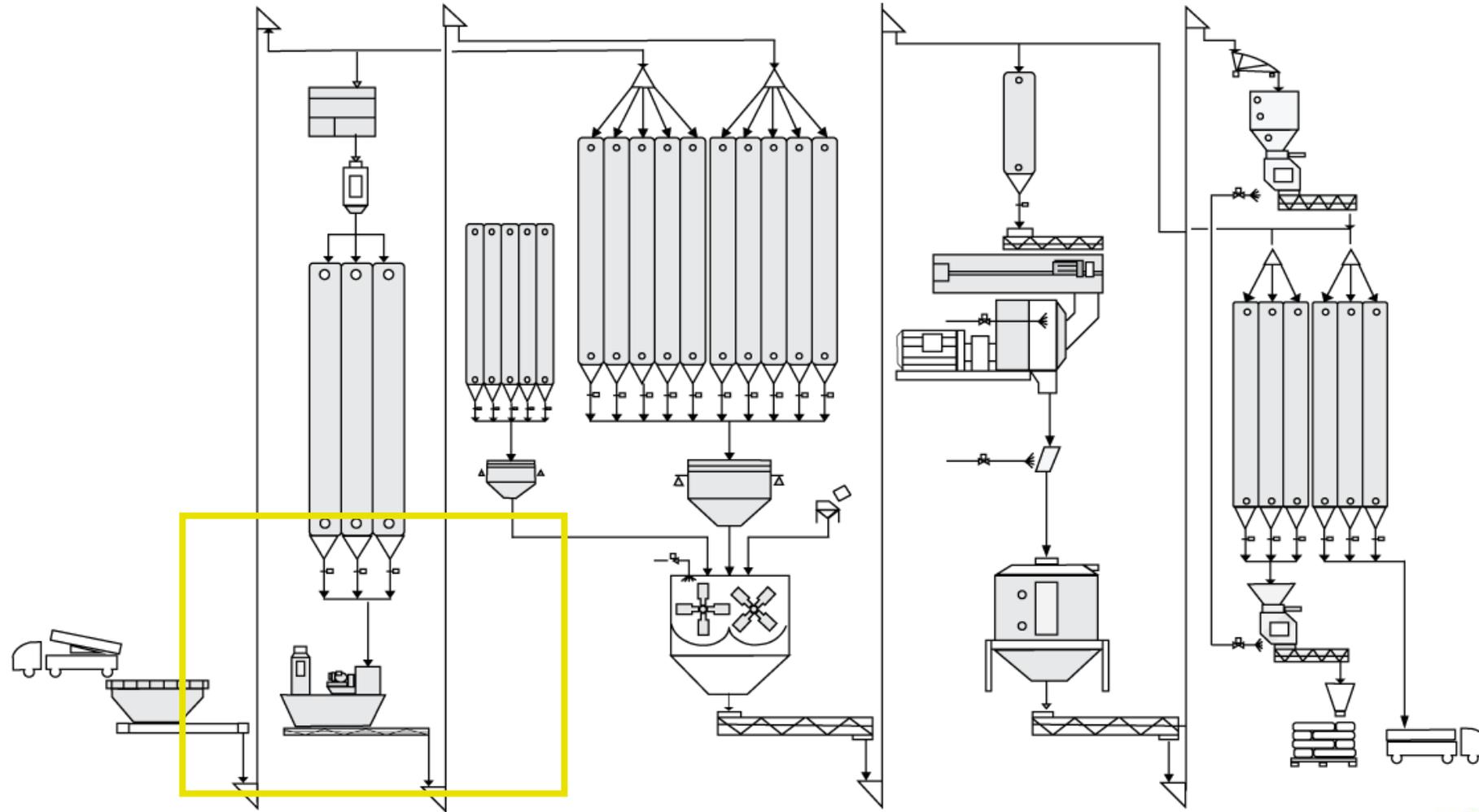
Feed mill diagram - Batching



Batching influences feed quality

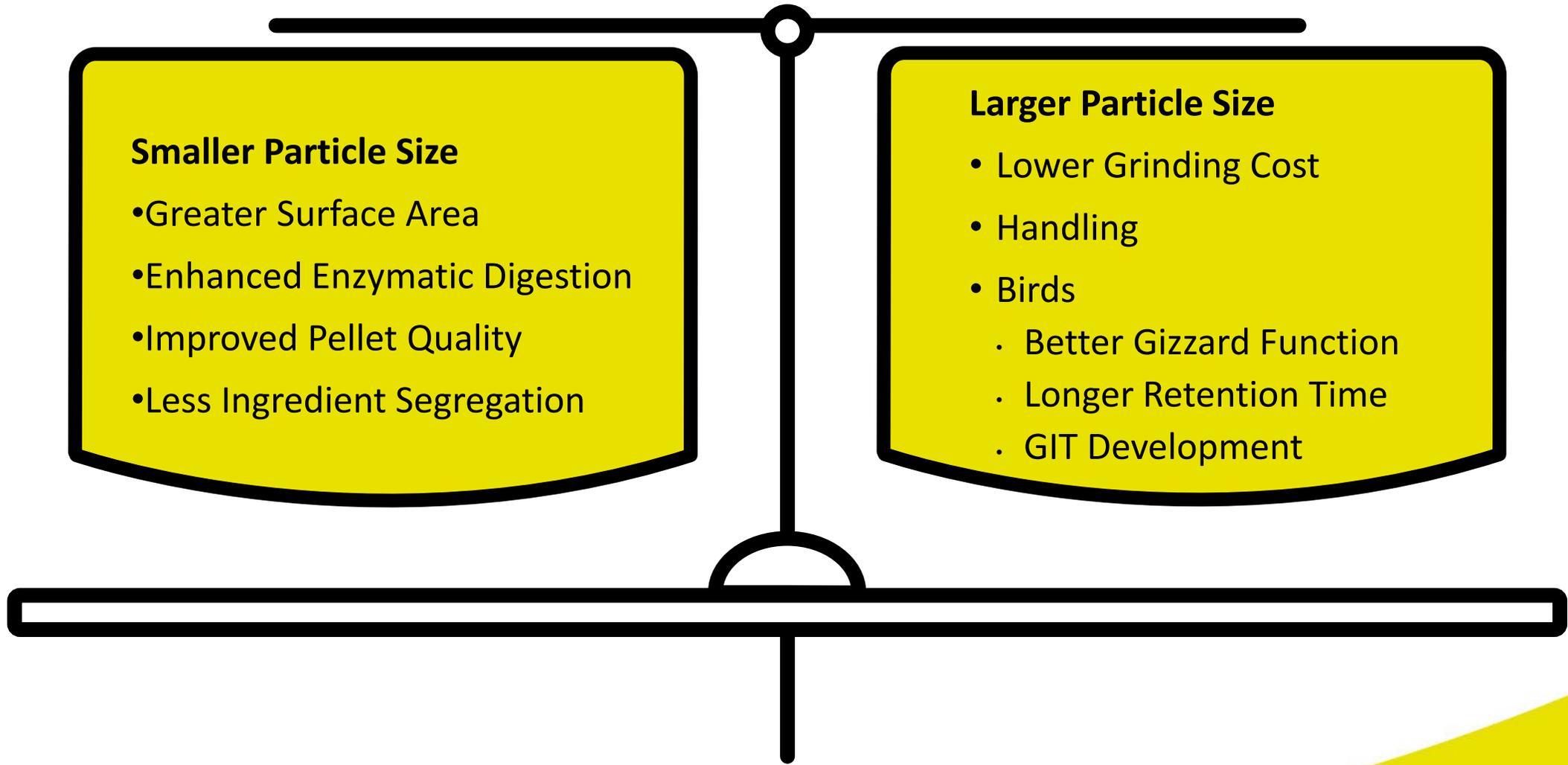
- Weighing accurate quantity of raw material as per the formula
- Batching accuracy plays a major role in feed quality
- Inaccurate batching results in either “CONCENTRATION” or “DILUTION” of feed nutrients
- Calibrate the batching bin load cell on a scheduled basis

Feed mill diagram - Grinding



Why Grinding?

- Decreased segregation
- Increased pellet quality
- Increased nutrient digestibility



Smaller Particle Size

- Greater Surface Area
- Enhanced Enzymatic Digestion
- Improved Pellet Quality
- Less Ingredient Segregation

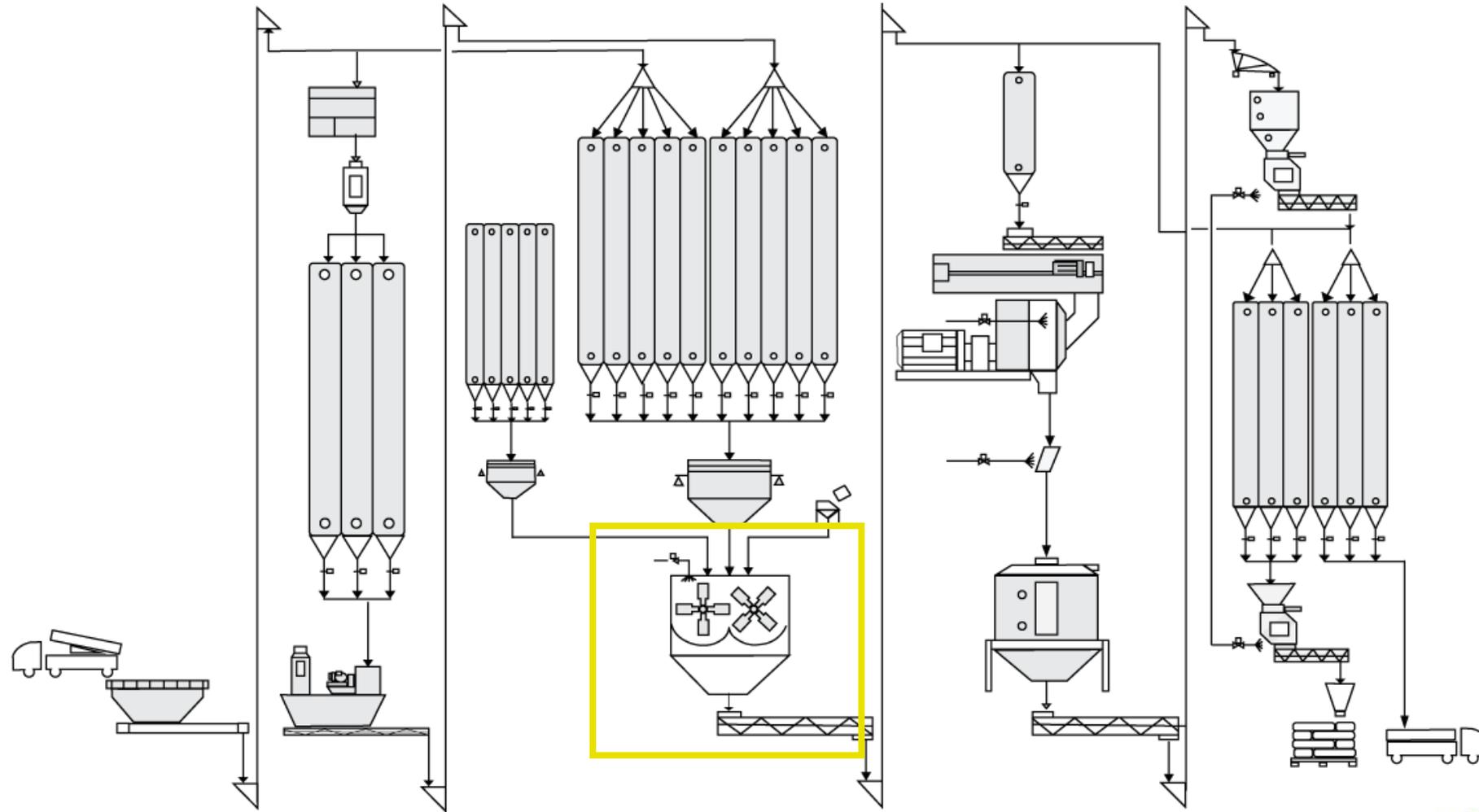
Larger Particle Size

- Lower Grinding Cost
- Handling
- Birds
 - Better Gizzard Function
 - Longer Retention Time
 - GIT Development

Bad grinding has negative effects

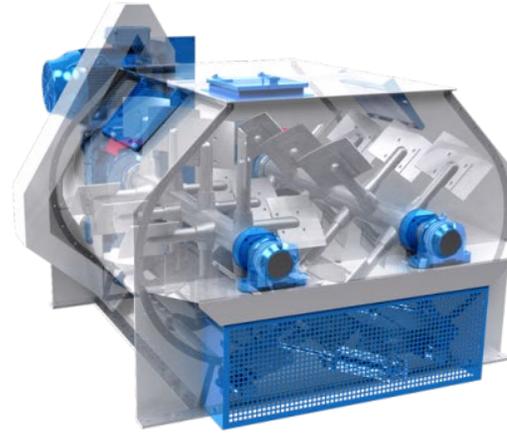
- Evaporates moisture
- Significant loss in weight
- Condensation in mill and transportation system surface
- Corrosion
- Ingredient residues
- Cross – contamination
- Mold problem

Feed mill diagram - Mixing



Factors affecting uniformity of mixed feed

- Mixer design
- Characteristics of ingredients
- Grinding
- Mixing time
 - Additives addition
 - Dry Mixing/ wet mixing
 - Liquid addition
- Under filling
- Over filling



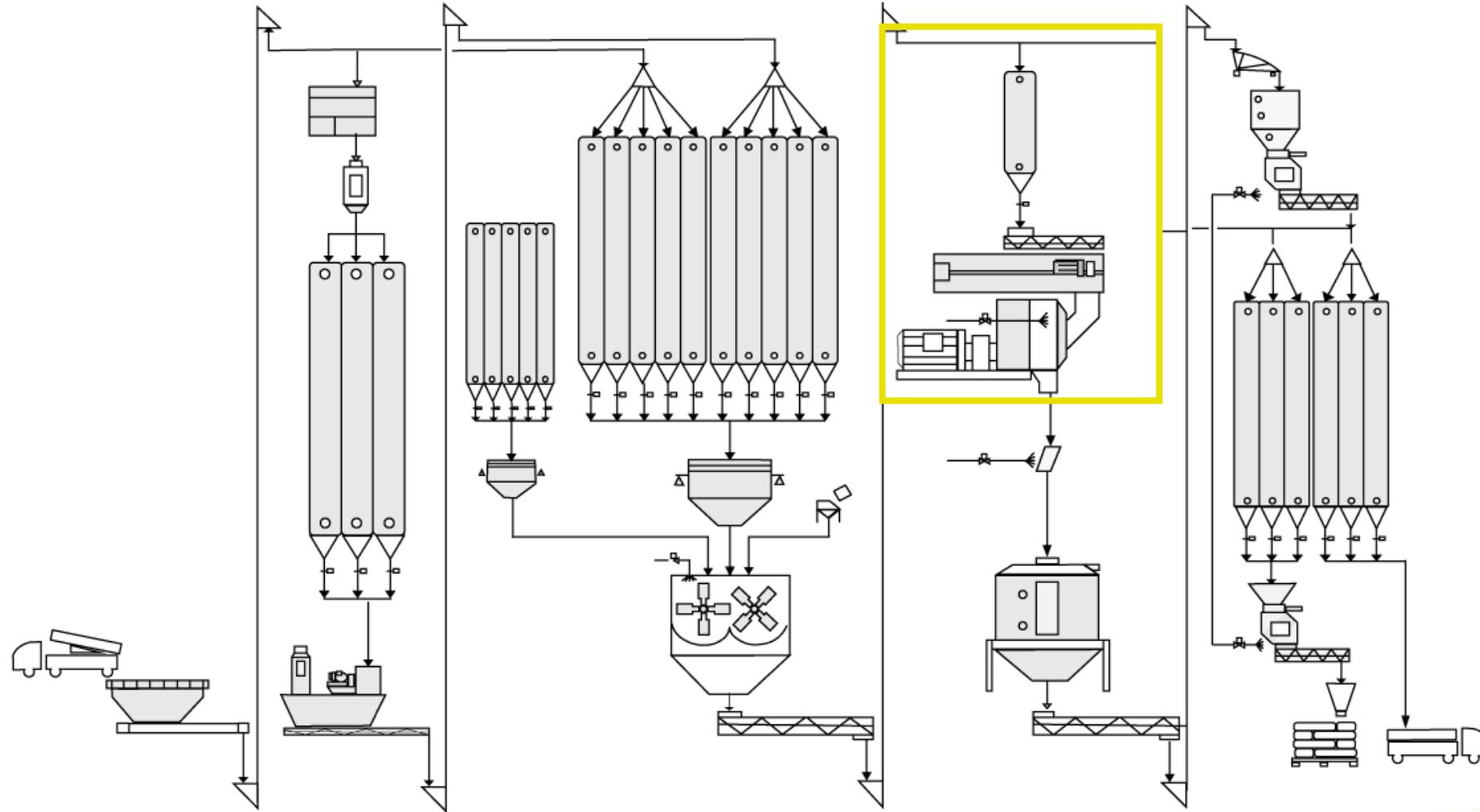
Mixer performance testing

- % CV < 10% ⇒ good mixing
- % CV > 10% ⇒ Increase the mixing time and/or inspect the system for factors responsible for the poor ingredient distribution
 - Sequence of ingredient addition
 - Particle size

Diet uniformity influences broiler performance

| | Salt CV% | | |
|---------------|--------------------|--------------------|--------------------|
| | 9.70 ^b | 12.10 ^b | 40.50 ^a |
| ADG, g | 30.30 ^b | 30.00 ^b | 23.60 ^a |
| ADF, g | 52.70 | 51.50 | 43.10 |
| FCR | 1.72 ^b | 1.74 ^b | 1.82 ^a |

Feed mill diagram – Conditioning and Pelleting



Why pelleting the feed?



For the feed mill

- Processing of raw materials into a compact form
- Feed microbial quality
- Efficient energy use



For the animal

- Better nutrient intake
- Lower selection & better feed intake
- Animal health and performance

Pelleting - Factors affecting process & pellet quality



Heat (steam)

- Gelatinization of starch
- Makes mash feed malleable
- Destruction of (some) pathogens

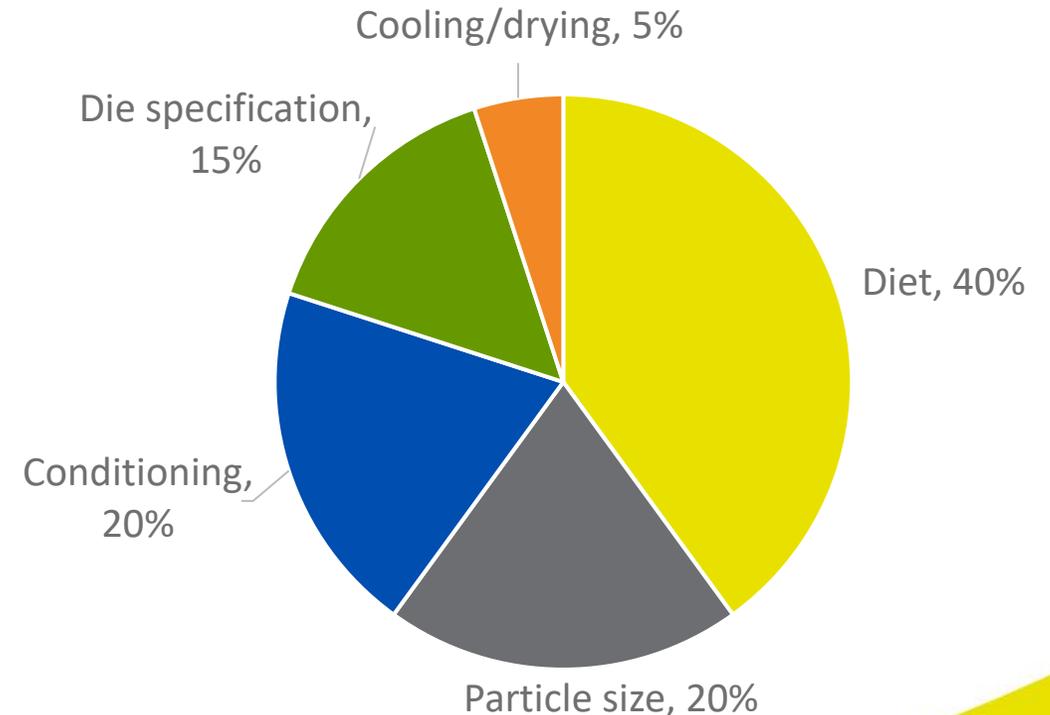


Moisture (steam)

- Hydrates mash feed
- Aids starch gelatinization
- Decreases friction

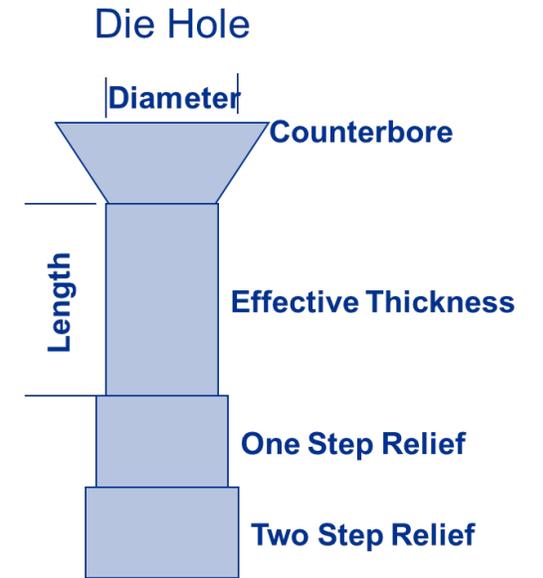
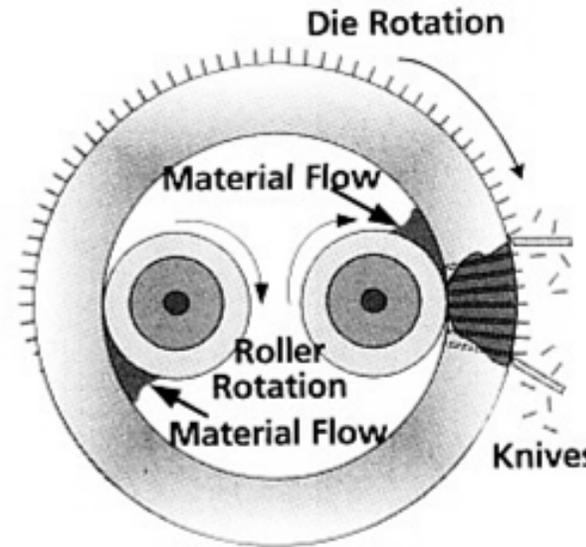
*For every 1% increase in moisture by steam addition, the meal temperature will be raised by approx. 15 °C

Factors affecting pellet quality



Pelleting

- Formulation impacts friction
 - Dry ingredients
 - Fat (type and amount)
- Throughput impacts exposure
- Interaction with conditioning
- Die specifications
- Pellet quality or additive stability?

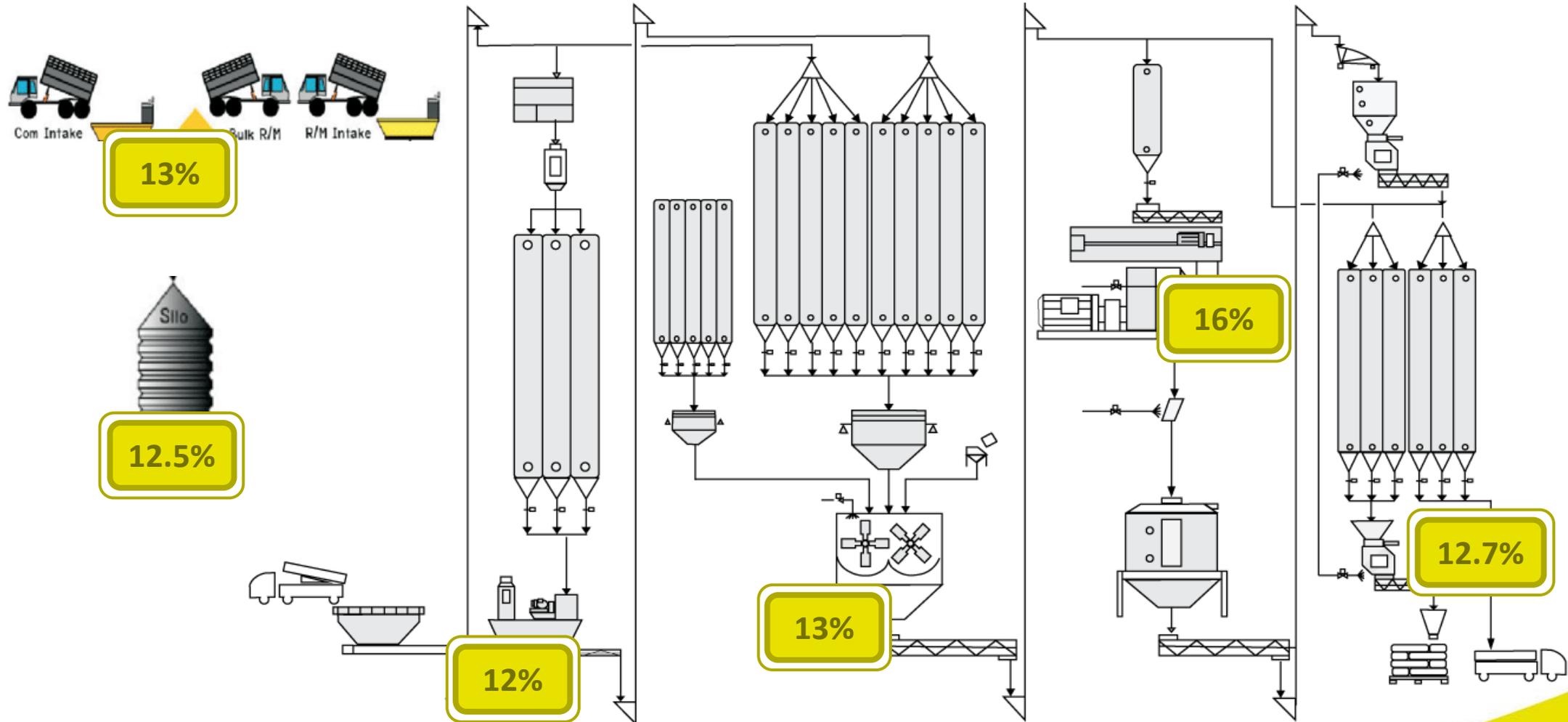


Pellet quality influences broiler performance

Broilers performance fed diets of various pellet quality from 30-38 days of age

| % Pellets | Weight gain, g | FCR |
|-----------|-------------------|--------------------|
| 100 | 725 ^a | 1.87 ^a |
| 80 | 701 ^{ab} | 1.88 ^a |
| 60 | 687 ^{ab} | 1.92 ^a |
| 40 | 685 ^b | 1.93 ^{ab} |
| 20 | 675 ^b | 1.95 ^{ab} |
| Mash | 643 ^c | 2.02 ^b |

Moisture optimisation | Process



Moisture optimization – Why is it important?

Moisture variation in ingredients and feed is constant

Low moisture in pelleted feeds leads to

- High process loss
- Low production efficiency
- Poor pellet quality

High moisture promotes

- Molds and fungi growth
- Mycotoxin contamination
- Poor pellet quality

Optimal moisture allows

Higher pelleted feed quality

- Microbial quality - Antimicrobial effects due to higher penetration of the steam
- Physical quality (PDI) - Starch gelatinization

More efficient production process

- Lower energy consumption
- Increased throughput of the feed mill

Moisture management lowers shrinkage or process loss

- Possible moisture process loss during the feed production: **0.5 to 3%**
- Main reasons: moisture & dust – surfactant helps to retain water

→ **Economic impact:**

0.5% process loss → 5 kg loss in a 1-ton batch

Example:

- 5 kg feed cost USD 2.00
- Feed production: 10,000 tons per month
- Loss / month = USD 20,000.00
- Loss / year = USD 240,000.00



Moisture influences pellet quality

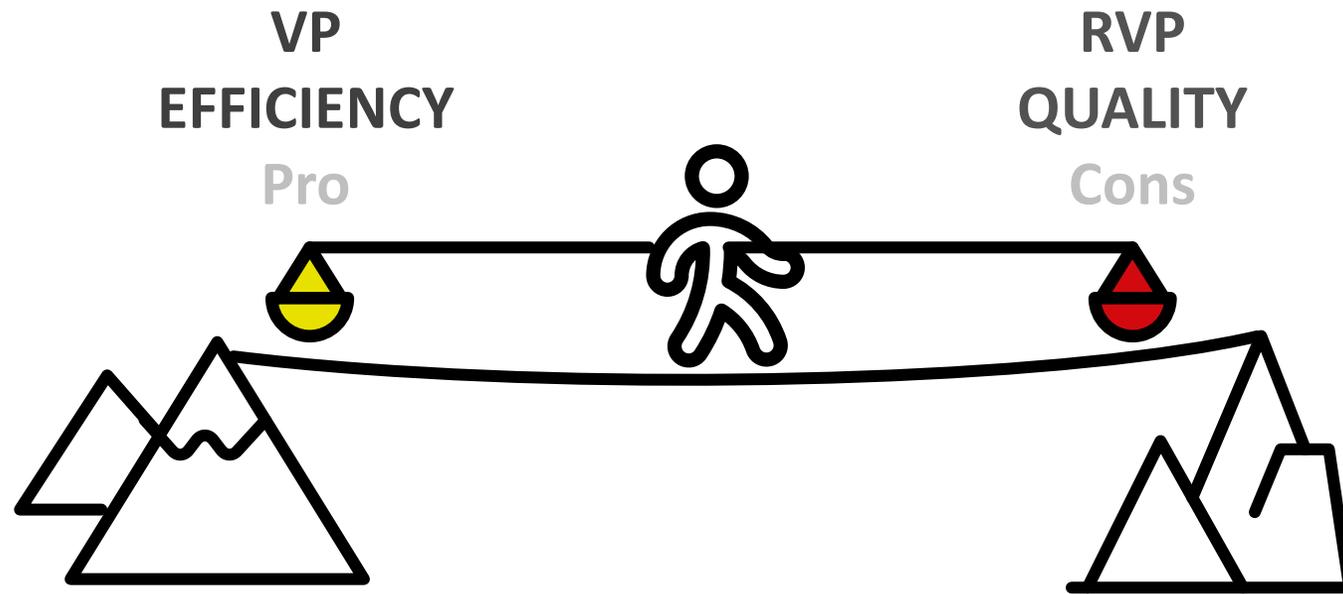
The effect of precise moisture control on the feed pelleting process

| Mash moisture content (%) | | | Production data | Temperature | | Pellet quality | |
|---|--------|--------------|-----------------|--------------|------------|-------------------|--------------|
| Incoming | Target | Conditioning | kWh/ton | Conditioning | Hot Pellet | PDI (%) | Moisture (%) |
| 11.4 | 12.0 | 15.1 | 5.21 | 180 | 190 | 77.6 ^a | 12.9 |
| 11.0 | 13.0 | 15.9 | 5.25 | 180 | 188 | 80.0 ^b | 13.3 |
| 10.9 | 14.0 | 16.8 | 5.19 | 180 | 188 | 83.9 ^c | 14.3 |
| 10.7 | 14.5 | 17.0 | 5.14 | 180 | 186 | 87.6 ^d | 14.2 |
| 11.1 | 15.0 | 18.5 | 5.09 | 180 | 186 | 88.6 ^e | 15.6 |
| a, b, c, d, e - Means within a column with different superscripts differ (P<0.05) | | | | | | | |
| | | | | | | | |

Conclusions and applications

1. Adjusted density corn-soybean-based broiler diet + moisture
 - ⇒ significant increase of pellet mill production rates while
 - ⇒ maintaining statistically similar pellet durabilities and fine percentages as diets without added moisture
2. Increasing the moisture to starch ratio prior to pelleting
 - ⇒ significantly improved starch gelatinization and more durable pellet
3. Addition of moisture to pre-processed mash
 - ⇒ may resolve problems of poor pellet quality associated with diets with high amounts of oil
4. Adjusted-density corn-soybean-based mash diet + water + pelleting
 - ⇒ significant increases in broiler LWG in the 3-to-6-wk grower period.

Balancing on thin line

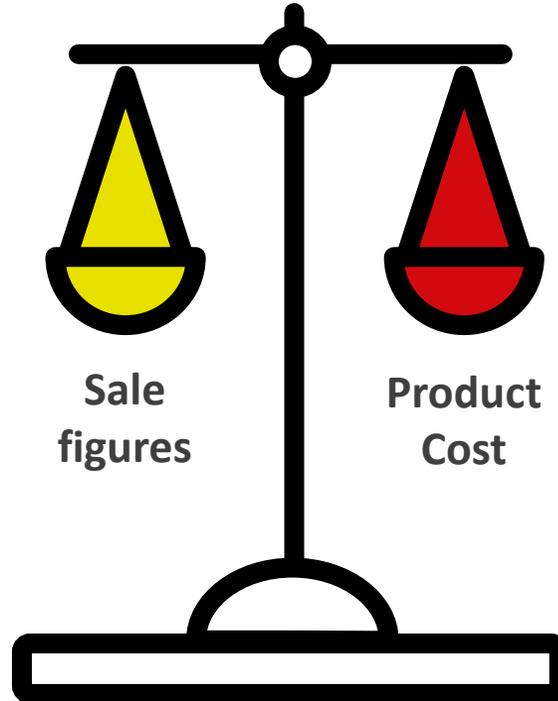


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Thank you!

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