15th Edition POULTRY INDIA

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SHAPING THE FUTURE

OF INDIAN POULTRY SECTOR

The Do’s and Don’t’s of Feed Milling

KNOWLEDGE DAY POULTRY INDIA

JON RATCLIFF

F.A.C.S. LTD

Livestock Feedmill Process Considerations

- Design & Upgrades
- Formulation
- Planning
- Biosecurity
- Receiving/Inspection
- Storage
- Grinding
- Premix and Hand Additions
- Batching and Mixing
- Conditioning
- Pelleting
- Cooling
- Crumbling
- Post Pellet Liquid Applications
- Packing/Bulk Loading
- Automation / Digitalisation
- Moisture
- Process Efficiency Measurements and KPIs

Design & Upgrades

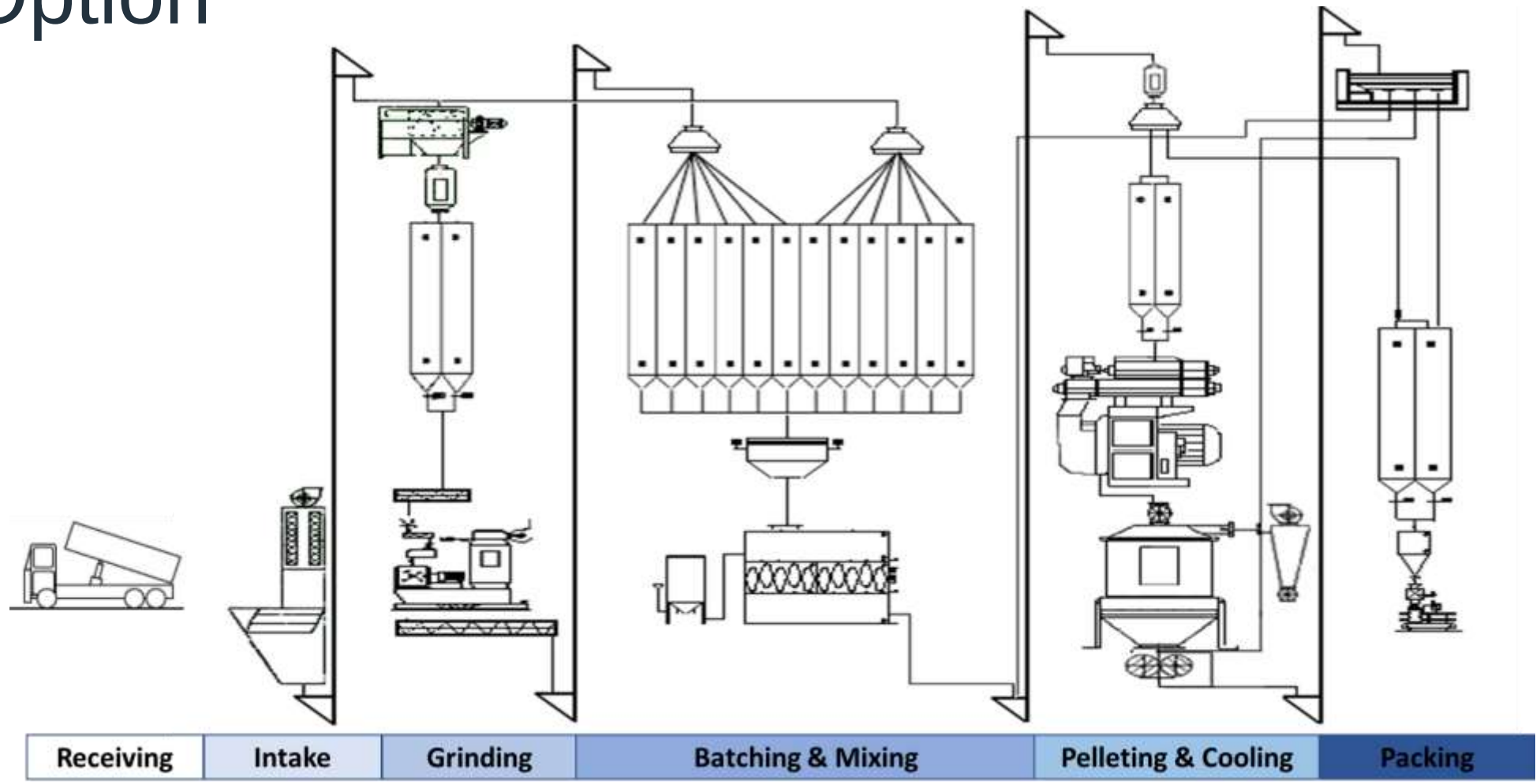
Do’s

- Make sure any new mills / modifications or line expansions are calculated to meet balanced target production level – Review bottleneck implications
- Factor in future expansion requirements – Sales forecast expectations
- Ensure you have the most appropriate equipment/supplier for the job – consider energy efficiency and aftersales support & service levels

Don’ts

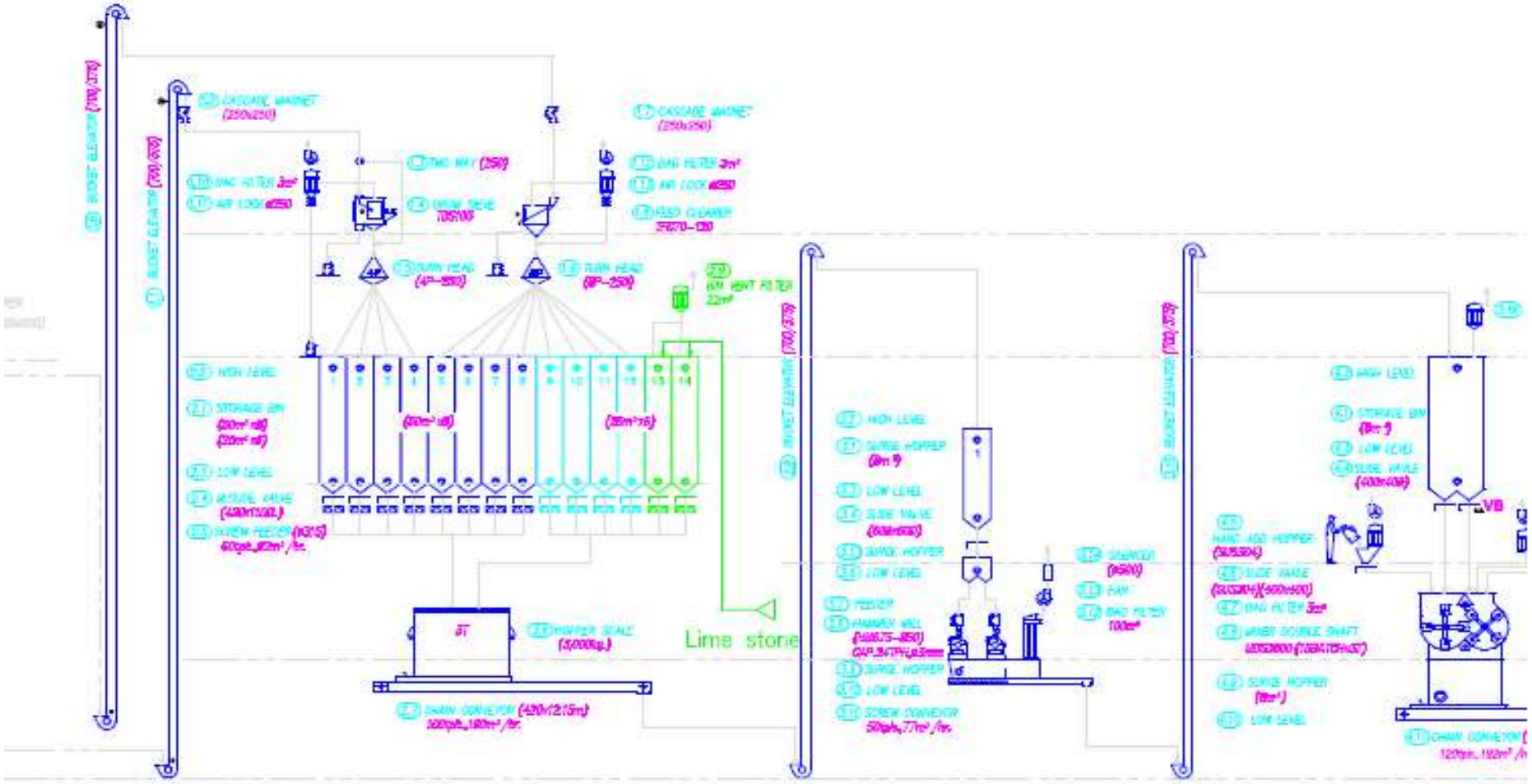
- Do not accept turnkey designs without careful independent checking
- Do not invest based on cost alone because it rarely pays back beyond the short term
- Do not commit to major investment without the necessary level of expertise and calculated ROI based on Capex and Opex

Feed Mill Process Pre Grinding Design Option



Source: Agentis Innovations

Post Grinding Design Option



Source: Agentis Innovations

Formulations

Do’s

- Review each new formulation before implementation
- Formulate based on production efficiency factors such as throughput, PDI and hardness not just nutrition – Use your manufacturing data (TPH / PDI / kWh/tonne / complaints to quantify impact on manufacturing costs
- Check that the process parameters are set correctly for each specific formulation

Don’s

- Try to avoid formulations that have a previous record of poor quality or throughput
- Do not formulate based on least cost alone
- Do not make changes to a formulation without approval and records

Planning

Do’s

- Record the throughput rates for each formulation/SKU so that expected run times for each production run can accurately be planned into the schedule
- Have cut off times for orders to be received for the next 24 hours of production to enable effective scheduling
- Plan for the longest production runs with fewest changeovers

Don’ts

- Do not accept additional SKUs without agreement of all interested departments
- Do not produce small batch sizes with low production rates without significant selling price adjustments – Challenge with Sales, low volume products
- Do not let sales control the production process!

Receiving/Inspection

Do’s

- Have an Approved Supplier list based on trading history, quality and assurance certifications
- Set up a realistic sampling plan for each ingredient based on risk
- Set realistic approval and rejection limits

Don’ts

- Do not assume raw materials are not contaminated
- Try not to accept a delivery that will cause a problem
- Do not continue with suppliers that have a poor quality track record

Storage

Do’s

- Consider automated route control from intake to bulk silos and bulk warehouses for full traceability
- Implement effective and accurate stock inventory procedures and FIFO ‘first in first out’ principles
- Maintain good standards of GMP, e.g Pest Control, Cleaning and Biosecurity

Don’ts

- Do not allow open access to birds and vermin or damage due to rainwater
- Do not allow cross contamination between different raw materials to occur
- Do not ignore specific storage conditions e.g. for heat sensitive products such as enzymes

Grinding

Do’s

- Ensure you have the correct rating and capacity of grinding to avoid bottlenecks
- Plan to achieve the correct balance between particle size and pellet quality
- Consider fitting Variable Frequency Drives to provide more flexibility with particle size and digital power meters to monitor energy consumption

Don’ts

- Do not run hammer or roller mills without an effective maintenance programme and regular inspections of hammers, screens and magnet/stone traps
- Do not run hammer mills above rated motor capacity and check filter bags regularly
- In post grind mills do not grind materials that are already below target particle size – Sieve before grinding / dosing fine materials directly to the mixer

Premixing and Hand Additions

Do’s

- Consider digital hand scales and Bar code or QR code for real time control of the preparation of hand additives and addition to the mixers
- Ensure accurate stock inventory of micro ingredients that match shift or daily consumption
- Consider microbin dosing to reduce labour and time

Don’ts

- Do not underestimate the importance of the accuracy of the preparation and hand addition process
- Do not run for extended periods without checking theoretical usage verses actual stock
- Do not operate microbins without the appropriate quality of the bins, discharge screws and scales appropriate for the types of additive

Batching

Do’s

- Ensure scales are appropriate for the amount of material being added and the design of the bins – minimum weighment accuracy
- Implement batching automation PLC system with control loss in weight and auto jogging functions
- The greater the number of varied size of scales you can install the better

Don’ts

- Try not operate tolerances in excess of 2% for major raw materials and 0.5% of micro ingredients
- Do not add quantities less than 1.5% of the total scale size
- Do not forget to clean and calibrate weigh scales on a regular basis

Mixing

Do’s

- Carry out regular Coefficient of Variation tests to monitor efficiency of the mixer
- Implement an effective cross contamination matrix for different feed types and carry out carryover tests for cocidiostats or medicines if these could be harmful to other feed types. Flush batches may be required.
- Ensure Dry mix time / wet mix time and total mix time are optimal
- Regularly inspect the inside of the mixer and clean as necessary

Don’ts

- Do not add liquids without the correct type of pumps and nozzles and spray pattern
- Do not add hand additions or micro ingredients until macro ingredients have been dispatched and before liquids start
- Do not over or under fill mixer or over mix through extended mixing times

Conditioning

Do’s

- Ensure the boiler and steam harness is correctly set up to deliver the correct quality and quantity of steam. Target is Dry Saturated steam at 103℃ - 105℃
- Check that the conditioner retention time allows for adequate gelatinisation (and for microbial control if required)
- Maintain correct set temperatures and consider auto divert process on start up until target temperature is achieved

Don’ts

- Do not use Dry Super Heated steam or Wet steam
- Do not insulate the steam pipe from the Pressure Reducing Valve to the entrance to the conditioner
- Do not over or underfill the conditioners

Pelleting

Do’s

- Understand the factors influencing the pelleting process (particularly moisture) and have parameter settings for each formulation
- Select the right rolls, die size and compression ratio for the target species
- Consider automation of the pelleting process to improve pellet mill output and quality

Don’ts

- Do not operate manual or semi manual control systems which lead to inherent variability and operator errors
- Do not run the motors with excessive load or wide variation in amperes
- Do not operate pellet mills without an effective maintenance programme

Counterflow Cooling

Do’s

- Ensure correct bed depth and level distribution inside the cooler
- Consider fitting VFD to the air exhaust motor for adjustment of airflow speed
- Understand the relationship between bed depth / retention time and final finished product moisture

Don’ts

- Avoid operating the cooler with pellet temperature differentials with ambient in excess of 8℃
- Avoid under or over drying due to incorrect air flow speed and air volume
- Do not operate the cooler without a fire slide and an automatic shut off system for whenever there is a downstream blockage

Crumbling

Do’s

- Select correct roller types and configuration
- Ensure feeder is distributing pellets across the full width of the rolls
- Ensure the roller gap is set correctly

Don’ts

- Do not expect good quality crumbs from low PDI pellets or wrong sieve selection
- Don’t run without monitoring the % of fines return to the pellet bin
- Don’t allow the rolls to touch or pinch

Post pellet Liquid Application

Do’s

- Utilise PPLA to avoid excess addition of oils at the mixer
- PPLA may be required for heat sensitive liquids such as enzymes
- If using a mass flow meter ensure appropriate modulating valve / pump and that it is specified correctly to the liquid used

Don’ts

- Do not operate PPLA without an effective maintenance programme
- Do not allow the PPLA to operate for long periods of time without cleaning or calibration
- If planning a new installation consider a batch weighing system if there is adequate space

Packing and Bulk Loading

Do’s

- Automate where possible for accuracy of weighing and traceability
- Consider auto packing and/or robot systems for bags to reduce labour costs
- Consider bar code / QR code systems for correct ID of trucks for loading and warehouse inventory control

Don’ts

- Do not operate loading areas with poor standards of hygiene and excessive access to birds
- Do not operate bagging systems without a bag weight checking procedure
- Do not forget trucks can be an important potential cross contamination or bacterial risk

Biosecurity

- Each feedmill should have a Food Safety & Quality Manual based upon HACCP and GMP
- The GMP procedures (or Operational PreRequisite Programme) will include cleaning, disinfection, waste management, pest control, warehouse management procedures etc
- The HACCP will define the Critical Control points in the process for control of Hazards and the methods to control and monitor each CCP
- Aim to keep spillages, dust leaks and build up of residues to a minimum
- Try to operate a ”clean” and “dirty” zone policy
- Vacuum and central vacuum systems are more effective for cleaning than sweeping.
- Aim for spillages and dust escape to be the exception rather than the expected
- Install local exhaust ventilation on silos and transport systems together with a maintenance system to address leaks
- Implement SOP’s and WI’s for specific equipment cleaning and disinfection, example pellet mills, coolers, bulk loading and packing bins and trucks

Moisture

- Moisture is fundamental to the feed mill process
- Moisture losses in raw material storage, drying, movement and grinding often result in significant product shrink (stock loss) $$$
- Failure to optimise the moisture between mixing and conditioning may result in less than optimal levels for gelatinisation and pelleting
- Further uncontrolled losses may occur during the cooling process
- A range of microwave sensors are available that not only measure moisture in the line in real time but include process control software that automatically adjust the levels of water or steam required

Automation & Connectivity

- Digitalisation is essential for survival. It is not something that is ‘nice’ to have anymore,
- The level of automation can range from a simple batching and mixing process to a fully automated gate to gate control system
- Specific standalone automation systems are available for premix preparation and hand additions, pelleting, packing and bulk loading
- When considering automation, also think integration. Ensure any standalone systems are compatible for integration with any existing automation
- The automation system provides the platform for data display and connectivity with sensors
- A range of sensors can be installed including digital power meters, steam flow meters, inline moisture sensors, NIR and maintenance sensors for example temperature and vibration
- Digital Power meters will provide a complete breakdown of energy usage for each stage of the production process

Process Efficiency and KPIs – “If its not measured it can’t be managed”

- The ratio between output gained and the input to run the operations.
- The inputs are the raw materials and liquids as well as fixed and variable costs associated with the manufacturing process – eg Labour & Energy.
- The outputs are finished product and customer retention
- To achieve Operational Efficiency the primary requisite is **DATA** provided by the mill SCADA and network of interconnected sensors and monitoring devices – This is where integration of automation is important
- Overall Equipment Effectiveness (OEE) measures the difference (%) between actual and the rated capacity of specific equipment, the line or the whole plant
- Key Performance Indicators can be set for factors such as **–**Total tonnes per net available hours, Manhours per tonne / kWh per tonne per product (SKU), maintenance downtime etc

Summary

- DO TRAIN YOUR STAFF, THEY ARE AN IMPORTANT ASSET
- EMBRACE DIGITALISATION AND UNDERSTAND THE BENEFITS IT WILL BRING TO YOUR PRODUCTION EFFICIENCY
- INVEST IN AUTOMATION TECHNOLOGY, BOTH HARDWARE AND SOFTWARE, TO MONITOR AND IMPROVE EFFICIENCY
- DOING NOTHING SHOULD NOT BE AN OPTION