Fortification at a Vertically Integrated Masa Facility - Best Practices

Summary: Fortification has three main requirements - the vitamin premix, a dosifier/feeder, and a way to thoroughly mix the premix into the masa. This document provides recommendations for best practices, but the specifics can be tailored to your production facility.

Setting up for Fortification

Premix

Premix is a combination of folic acid, filler, and free flow agent. To procure premix, identify a licensed provider and compare quotes from multiple sources to determine the most cost-effective and reliable option. Ensure all shipments should include a certificate of analysis and addition rate instructions. Premixes should be stored using a first-in, first-out system. The premix supplier should provide an estimated addition rate.

Equipment

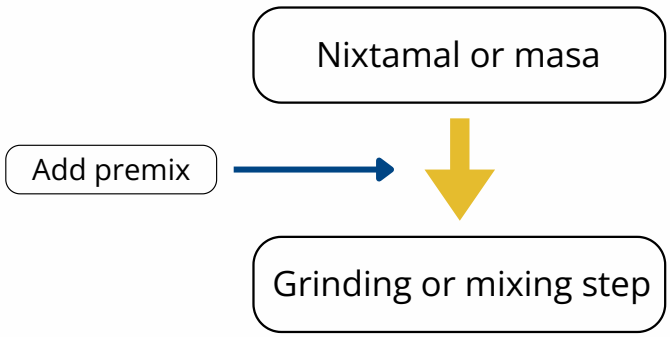
First determine if your existing microingredient feeder or dosifier can be used to add folic acid.

- Options for purchasing a dosifier [1]:
  - Volumetric feeders dispense a set volume of premix at a constant rate. This is the most common and least expensive option.
  - Loss-in-weight feeders take a continuous reading of the weight of premix over time, allowing for a true addition rate measurement. This system is more complex and expensive.
- Different feeders are available, but the most common and easiest to maintain is a screw feeder.
- An anti-bridging device is needed to ensure consistent premix flow.

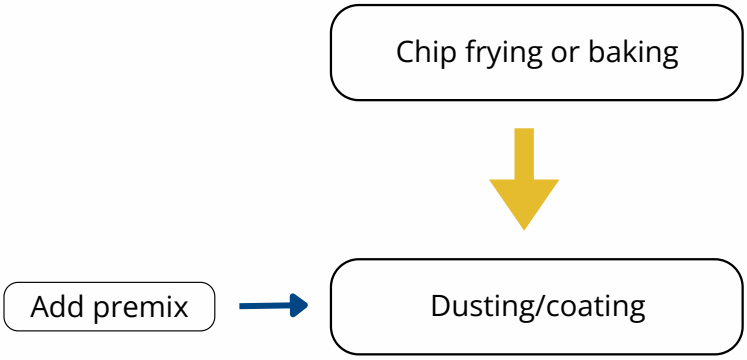
Dosifier (feeder) location

- Dosifiers (feeders) should be installed in a dry, easily accessible location out of the sun.
- Premix should be added at either:
  - A location where the flow rate is consistent so the premix flow rate can be calibrated accordingly
  - A dusting stage with flavor coating or other topical additives (likely only applicable to tortilla chips)

Where to add premix - Masa



Where to add premix - Tortilla chips



Dosifier (feeder) continued

- **Do not** mix folic acid with other additives in the same dosifier. Premix is very concentrated and can react with other additives until diluted in the masa.
- The feeder must be calibrated before usage in a production run.

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Control Systems

Premix control systems should match the technical capacity of the production facility and maintenance program.

- Manual: Feeder settings and operation controlled manually by the miller
- Basic sensors and interlocking: Sensors are used to monitor for incoming masa and switch premix feeder on and off as needed. Sensors also can monitor premix level and flow and are able to warn operator of issues.
- Advanced sensors and interlocking: Loss in weight feeders used with an online masa scale that starts and stops the premix feeder using a baseline flow rate.
- Automated controls: Programmable logic controller continuously matches the addition rate of premix to the measured flow rate of the masa.

Mixing

Folic acid must be added at a point where it can be properly homogenized with the masa. If adding as a liquid while steeping corn, thoroughly mix the combination. If using a dosifier, it should be placed before a grinding or mixing step. If adding with flavoring on tortilla chips, ensure the coating is uniform and reaches all chips.

Why Fortify?

Folic acid is a manmade form of vitamin B9 needed for development of the brain and spine during pregnancy. Fortifying milled grain products with folic acid is a proven method to reduce severe birth defects of the brain and spine [2]. Folic acid fortification of wheat flour has helped reduce these birth defects in the US, and fortifying corn masa can contribute to further prevention.

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Stability and Storage

Fortified wet masa does not retain folic acid well. Fortification should happen as close as possible to baking or frying, or as a final step if adding premix as a coating.

Internal Monitoring

Premix reconciliation

Compare the amount of premix used over a given time period to the amount of masa produced in the same period, then compare that to the target addition rate [4]. This should be done on a daily or weekly basis. In automated systems with loss in weight premix feeders and in line masa scales this reconciliation can be programmed for real-time reconciliation.

Sampling for quantitative testing

Take five (5) 500 gram samples at 10 minute intervals. Samples should be sent for testing at laboratory with an ISO-17025 certification for folic acid [5]. Sample at least every quarter for manual systems, and every 6 months for loss-in-weight systems.

Record Keeping

- Maintain documentation of premix use and reconciliation
- Ensure composite sample test results are kept on file

References

1. Johnson Q. Feeders and Mixers for masa Fortification: A Guide for Selection, Installation, and Procurement. Ottawa, Canada: The Micronutrient Initiative; 2005.
2. World Health Organization. Guideline: Fortification of Wheat masa with Vitamins and Minerals as a Public Health Strategy. Geneva: World Health Organization; 2022.
3. World Health Organization. Monitoring masa fortification to maximize health benefits: a manual for millers, regulators, and programme managers. Geneva: World Health Organization; 2021.
4. Nutrition International. Capacity Building of Small Millers: Training Manual. Nutrition International; 2017.

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