

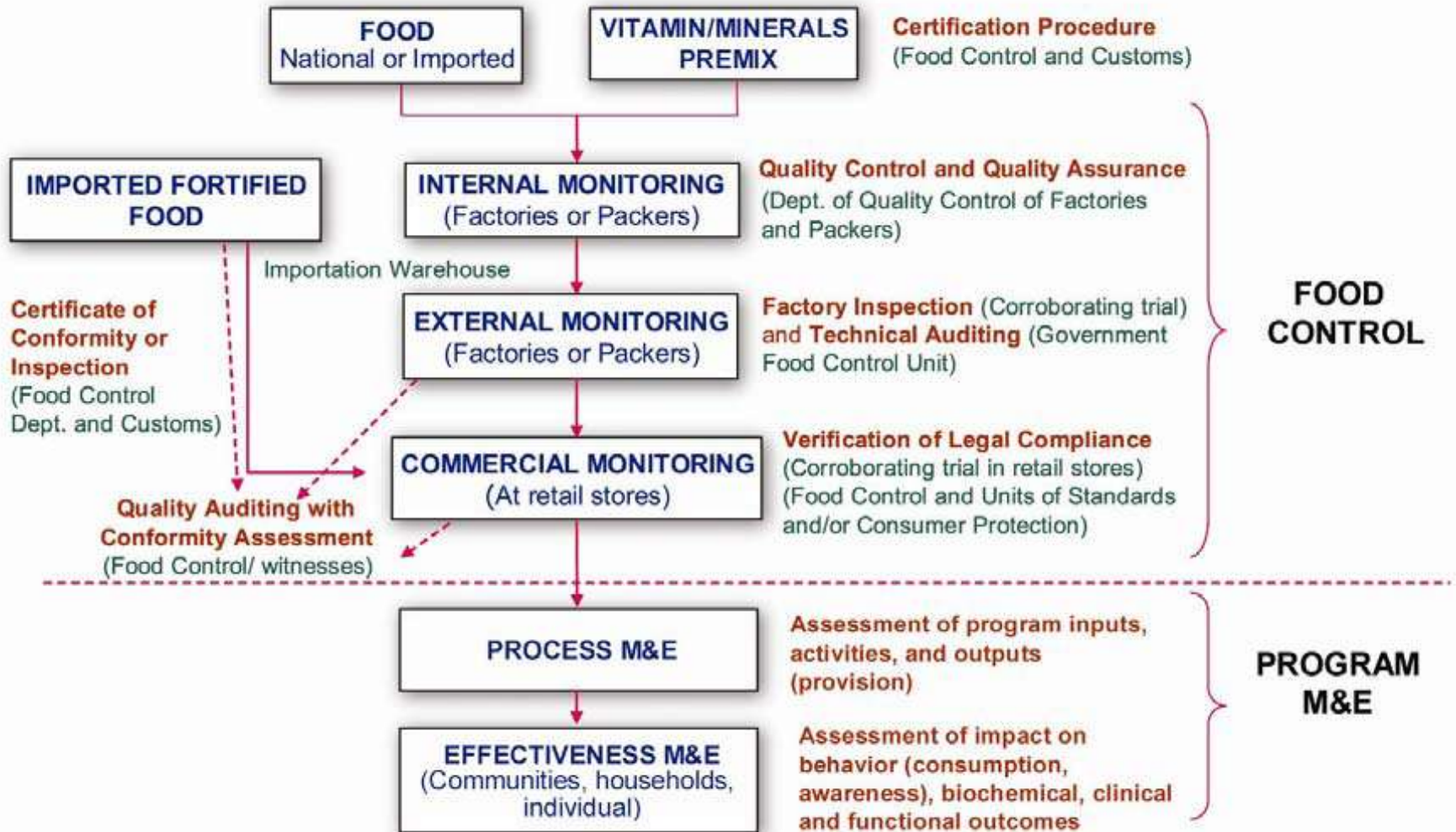
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Addressing Micronutrient Deficiencies Through Flour Fortification
In the CEE/CIS Region

Internal Monitoring: Quality & Process Control of Fortification at the Flour Mill

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Framework for Monitoring of Flour Fortification Programs



Quality Assurance Definition

A system to control all parts of the milling production process to ensure the consistent production of flour that meets both regulatory and commercial requirements.

Process control of fortification at the mill is a key component of the Quality Assurance system (Internal Monitoring).

Quality Assurance Components

Large Processors

- Documented quality plan
- Internationally recognized system i.e. HACCP, ISO
- Good Manufacturing Practice documents (GMP)
- Standard Operating Procedures (SOP)
- Standard Quality Control Procedures (SQP)
- Recall system with action plan and traceability system
- Document and record-keeping system
- Quality audit plan

Process Control in Food Fortification

- Food fortification needs process controls to ensure consistent quality and safety of the output: **flour adequately fortified with required essential minerals and vitamins.**
- Effective process control systems use mechanisms to monitor activities and take timely corrective action.
- Well-implemented process control gives an early warning of problems which in turn helps to avoid wastage, reworking of product, customer complaints, food recalls and liability issues etc.
- Good process control systems include multiple measurable parameters – they do not rely on just one parameter

Example: Quality Assurance for Flour Fortification: Mill Requirements and Responsibilities

- Premix procurement and storage
- Feeder/Dosifier installation
- Feeder calibration
- Feed rate calculations
- Process controls
 - Check weighing, standards and sampling schedule
 - Iron Spot Test for flour
- Record keeping
- Laboratory analysis
 - Quantitative test for iron and vitamins for flour

Ultimate Process Control of Flour Fortification

- Modern mills with computer control systems
- Automatic feeder –flour scale feedback systems controlling the process
- Premix release system
- Stock reconciliation method on weekly or monthly basis
- Iron spot test used as mill QC tool
- Good access to qualified laboratories for quantitative analysis for monitoring

Acceptable Process Control of Flour Fortification

- Manual feeder operations – volumetric-type feeders for flour
- Interlocked with either 1st break sifter or flour collection conveyor motor
- Feeder calibration
- Check weighing 2 – 4 times per shift
- Iron Spot Test for flour
- Premix release system
- Stock reconciliation method on weekly or monthly basis
- Access to outside testing laboratory for quantitative testing

NOTE: All points above are recommended to be used by reputable companies and are auditable and measurable by food inspectors

Premix Procurement and Storage

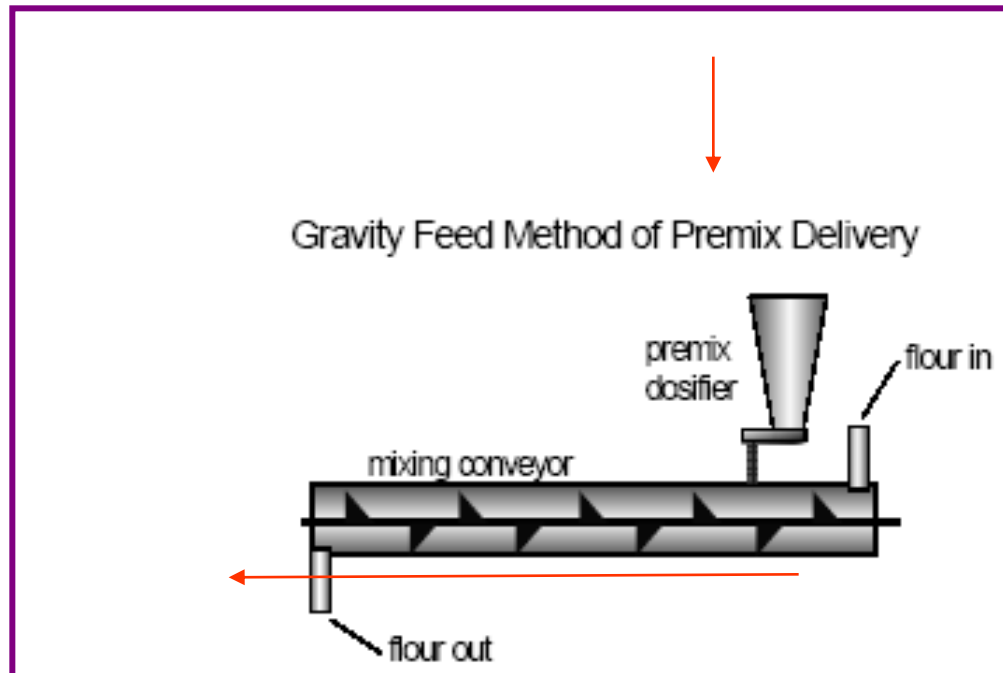
- Premix specifications or standards
- Approved supplier list at least 2 suppliers
- Purchase and storage records
- Cool dry storage room or area (A/C possible)
- Stock rotation First In First Out system
- Usage records including premix lot numbers

Example: Flour Fortification

Feeder Placement - Gravity Feed System

1. Feeder is placed above flour collection conveyor.
MUST BE 3 METERS FROM DISCHARGE END OF CONVEYOR
2. Premix falls directly into the flour as it flows through the conveyor.

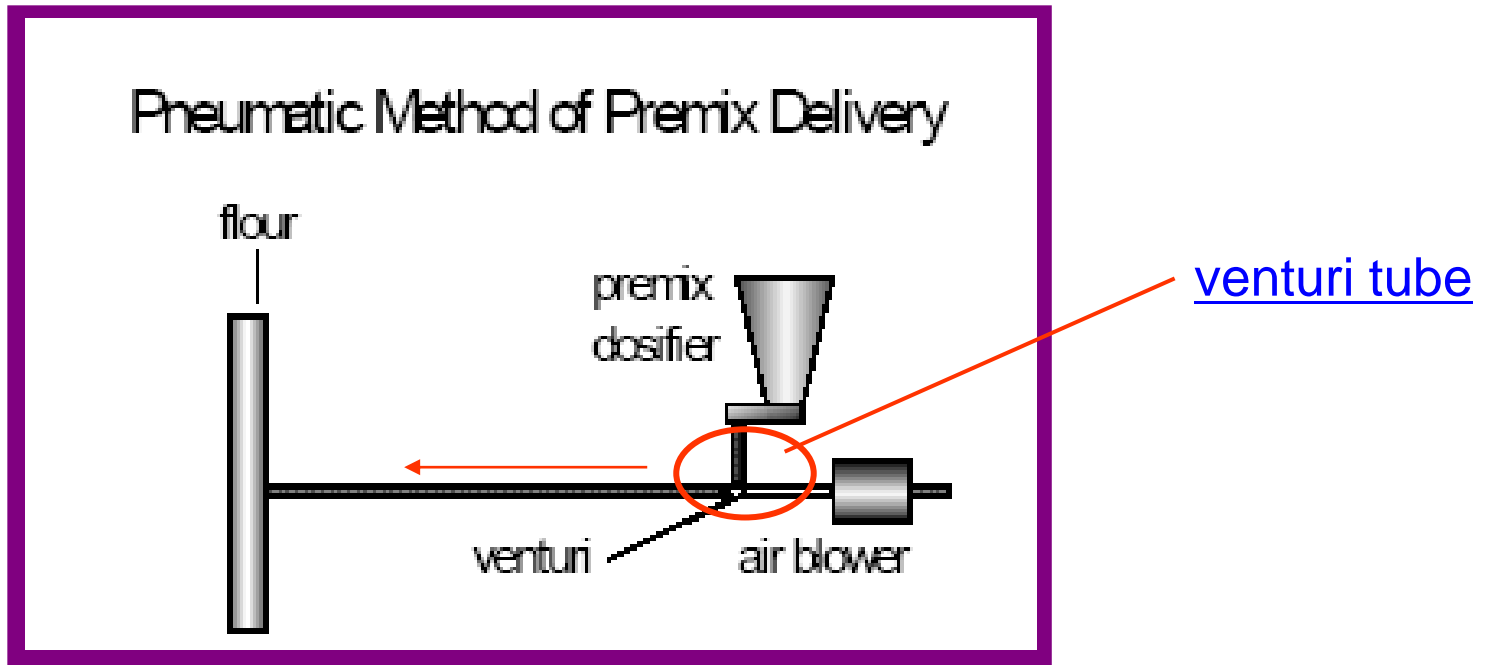
Feeder is usually placed above or near the flour collection conveyor that blends the various flour streams.



Flour Fortification: Feeder Placement Pneumatic System

1. Premix drops into a venturi tube, that injects the premix into an air stream.
2. Premix is blown by positive pressure or sucked by a vacuum through a pipe into the flour collection conveyor.

Occasionally, a downstream location in the flour flow can be used to add premix provided it will be well mixed with the flour.

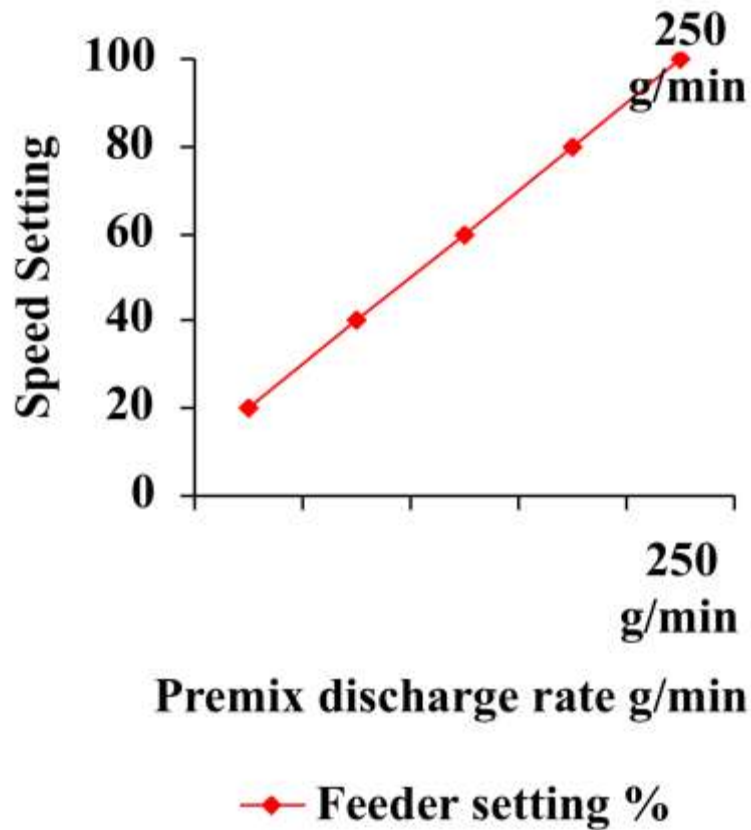


FEEDER SIZING AND FEED RATE CALCULATIONS

Mill Size	60 MT	100 MT	200 MT	360 MT
Flour	45	75	150	187.5
Kg/min	31.25	52.08	104.17	347
Premix	200 g/MT	200 g/MT	200 g/MT	200 g/MT
Add Rate	6.25 g/min	10.6 g/min	20.8 g/min	69.4 g/min
Premix use	3.0 kg/ 8 hr	5.1 kg/ 8 hr	9.9 kg/ 8 hr	33 kg/ 8 hr

NOTE: Similar system recommended for salt iodization

Feeder Calibration



- Direct Drive Motors
- Volumetric Feeders
- Determine minimum and maximum discharge for premix
- Premix weight and volume based on density of components

Feeder Problems - Prevention

- Bridging – use of stirring device inside feeder hopper – agitator or screw mixing
- Tunneling – use of stirring device
- Mill stops, feeder continues – electrical interlock between mill and feeder
- Feeder empty or stops – audible alarm system

FORTIFICATION AT THE MILL

Equipment Requirements

- Collection conveyor with paddles or cut/folded flights (maximize agitation)
- Feeder with mechanical or electronic controls to adjust feed rates
- Conveying system to deliver premix to flour
- Weigh scale to verify premix addition rates (QC check)

Product Testing

Qualitative vs. Quantitative

- Product testing is used as just one of the tools available to the producer – used in conjunction with other process control tools
- Use of one micronutrient as indicator for rapid qualitative/semi-quantitative testing
- Iron is used at the global level for flour
- Quantitative testing on full fortificant profile of flour typically on monthly or every 2 months basis

Premix Control Records

Why?

- To verify that premix is being added at the correct levels using an inventory control system.
- Act as a cross check to premix addition rate records
- Can be calculated weekly or monthly
- As a QA/QC and HACCP audit tool

Yemen Flour Mill

– QC Monitoring Report Form

YEMEN FLOUR MILL
QUALITY ASSURANCE DEPT.
MONITORING REPORT OF MICROBIOLOGICAL

DATE	AREA	NO. OF SAMPLES	FROM WHICH THE SAMPLES	NO. OF POSITIVE SAMPLES	NO. OF COLONIES	NO. OF CFU	NO. OF TITERS	COMMENTS
24/2/2018	A	1	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	
		2	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	
		3	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	
	B	1	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	
		2	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	
		3	1000	1000	1000	1000	1000	
			1000	1000	1000	1000	1000	

Premix Control Record Calculation

Example of 400MT flour per day 25 days (month)

- A. Starting Inventory 2,140 kg
- B. Amount purchased 10,000 kg
- C. Ending Inventory 10,040 kg
- D. Amount used (A+B-C) 2,100 kg
- E. Fortified Flour produced 10,000 MT
- F. Actual Addition Rate (D/E x 1000) 210 g/MT
- G. Target Rate* 200 g/MT
- H. Percent of Target (F/G x 100) 5 % above target
- * Based on supplier specifications

NOTE: This record calculation is used by Food Control Inspectors in US and Canada for compliance inspections:

Accuracy of System

WFP Afghanistan Example

- 3 mills in Peshawar and Quetta
- Flour milled for WFP Afghanistan's Women's Bakery Project 1999-2005
- Based on premix stock release system tied to flour orders
- Final assessment
- Premix addition was within $\pm 3.0\%$ of target addition rate

For additional information, visit:

www.FFInetwork.org

<http://www.ffinetwork.org/monitor/index.html>



Flour Fortification Initiative

A Public-Private-Civic Investment in Each Nation