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Universal Flour Fortification Policy Planning Forum

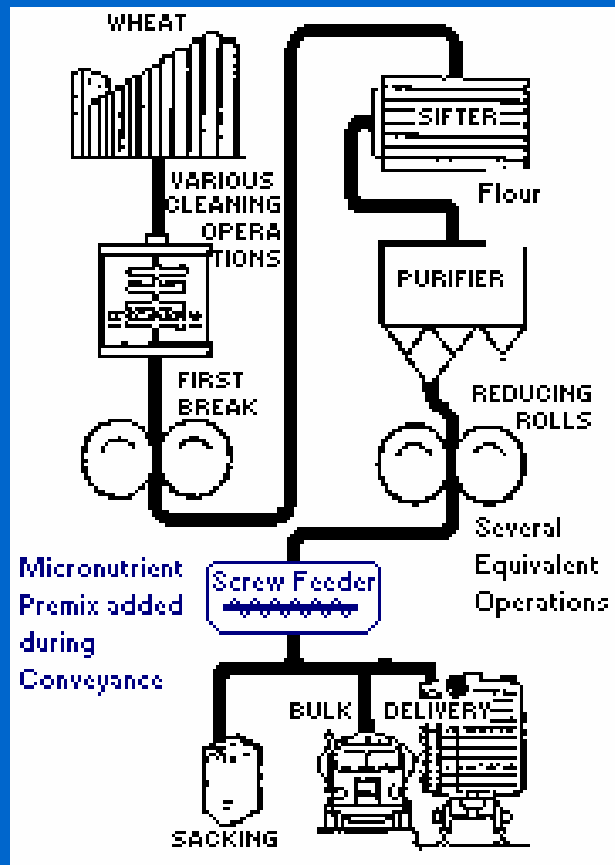
Wheat Flour Fortification:
What is needed at the mills?



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FEASIBILITY OF FLOUR FORTIFICATION



- ✓ Technology - simple and well established
- ✓ Extensive experience - 50+ years of history and over 30 countries currently fortify cereal flours
- ✓ Economical - very cost-effective in providing iron and other nutrients

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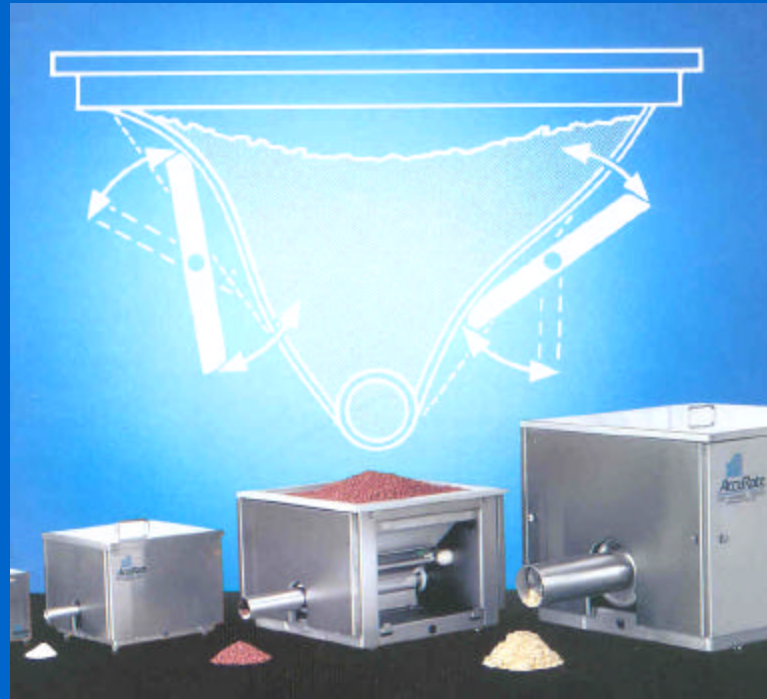
At the Mill, Fortification requires the following:

- Equipment - Feeders
- Mill infrastructure modifications
- Premix
- Processing
- Quality Assurance and Quality Control systems

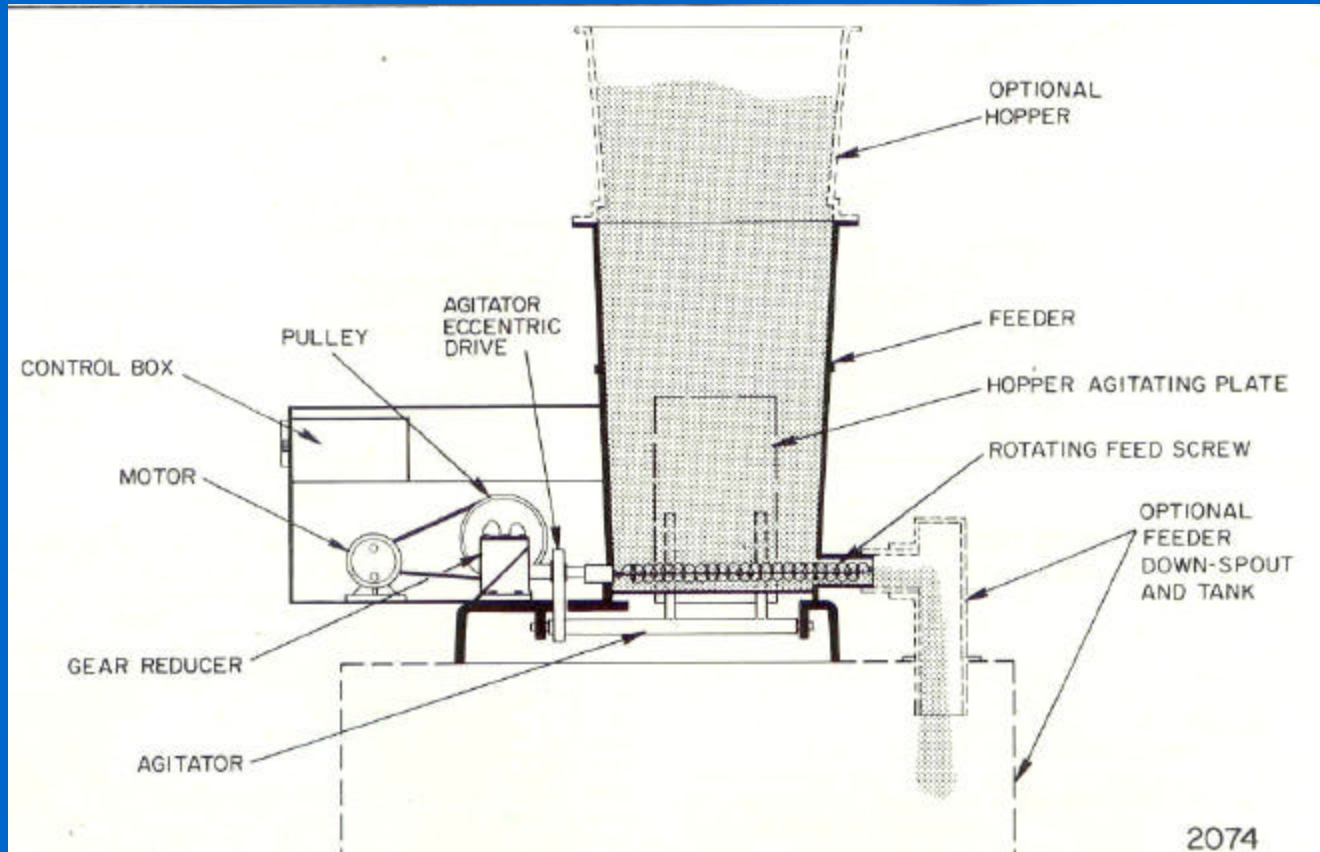
Implementation Costs of above will be Reviewed

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Volumetric Feeder: Screw type with flexible hopper



Feeder: Screw type Diagram



Large Scale Mill: Feeder installation El Fayoum mill Egypt



Flour Scale, Premix
Feeder, Egypt

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)

FORTIFICATION AT THE MILL

Premix Addition Method

- Volumetric addition
 - Assumes consistent density of premix as added
 - Premix weight is set by bulk density of ingredients added. Iron is dense compared to vitamins
- Loss in Weight (Gravimetric) addition
 - Based on weight addition

FORTIFICATION AT THE MILL

Operational Requirements

- Premix added to flour as it is milled
- Flour and premix controlled accurately
- Flour streams collection system acts as built-in blender

FORTIFICATION AT THE MILL

Operational Recommendations

- Continuous Addition Method
- Volumetric or Gravimetric Feeder
- Mixing/Collection conveyor (flour collection conveyors)
- Feeder Placement
 - Directly on top of Conveyor (gravity feed)
 - Blowline from feeder to conveyor or flour blowline

FORTIFICATION AT THE MILL

Operational Recommendations

- Feeder/Dosifier and Flour collection conveyor MUST be electrically interlocked to prevent under/over addition or
- Connected to mill control panel
- Loss in Weight Feeders should be interlocked with flour scales

Premix Requirements

- Specifications
 - Ingredients, Purity FCC/USP/BP
 - Elemental Iron v. Ferrous Sulphate
- Dosage Levels
- Storage Conditions: Cool, Dry, Dark (Vit A); Stock Rotation using FIFO
- Certificate of Analysis (supplier)

TYPICAL PREMIX COMPOSITION

(Wheat Consumption Level Of 100 g/day)

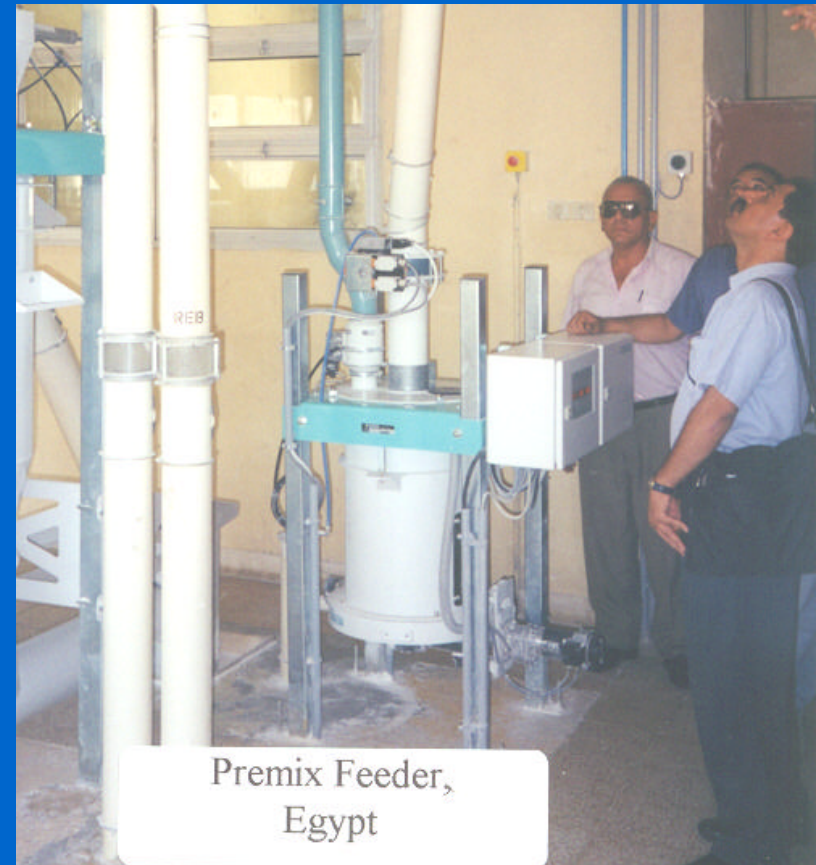


- Iron - 35 ppm (as elemental Fe)
- Riboflavin – 2.5 ppm
- Thiamin - 3 ppm
- Niacin – 30 ppm
- Folic acid - 2 ppm

COST OF THE PREMIX

The Main Cost Component For Flour Fortification

- 200 gm of Premix per metric ton of flour
- Cost US\$ 3.60/ kg
- Cost of Premix per MT flour – US \$0.36
- Cost of Premix as % of flour cost : ~ 1%



Milling Industry Requirements

- Purchase Equipment and Premix supplies
- Routinely inspect processing equipment
- Validate the blending process for consistency
- Monitor flour ready for distribution
- Keep adequate Records

QUALITY ASSURANCE

Mill QC Requirements

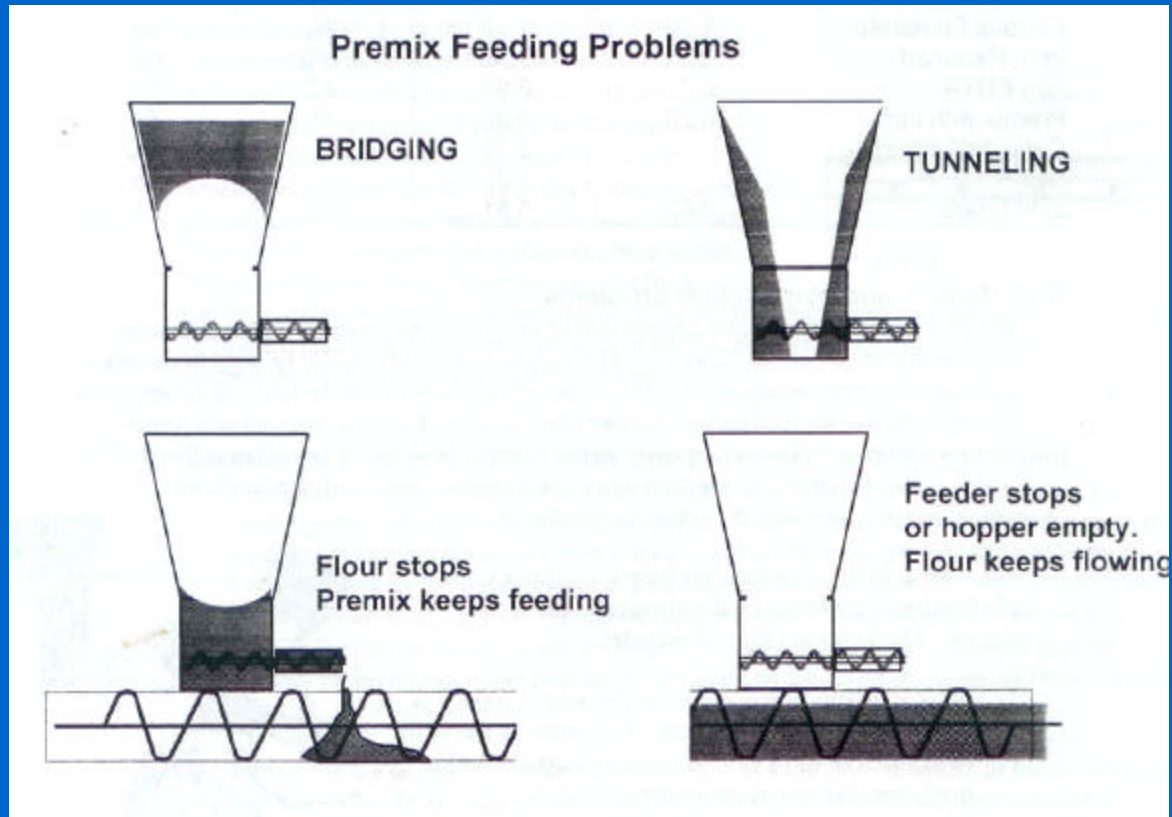
- Feeder/Dosifier Calibration
- Feed Rate Calculations
- Process Controls
 - Check Weighing: Standards and Schedules
 - Spot Test for Iron
- Record Keeping and Usage Reconciliation
- Laboratory Analysis
 - Iron and Vitamin Assays

QUALITY ASSURANCE

Premix Requirements

- Specifications
 - Ingredients, Purity, USP/BP/FCC
- Dosage Levels
- Storage conditions
 - Keep cool, dry and from light (Vitamin A)
- Stock Rotation
- Certificate of analysis

Feeder problems



Quality Assurance

Other considerations

- Method of Analysis
 - Iron; Atomic Absorption, Spectrophotometric
 - Vitamins; HPLC, GC
 - Use of Official Methods ICC, AOAC, AACC
- Analytical Variation
 - Iron +/- 25%
 - Folic Acid +/- 50%

QUALITY CONTROL FEED RATE CALCULATIONS

Mill Size	25 MT	100 MT	500 MT
Kg/min	17	69	347
Premix	600 g/MT	200 g/MT	200 g/MT
Add Rate	10.2 g/min	13.8 g/min	69.4 g/min
Premix use	4.9 kg/8 hr	6.6 kg/8 hr	33 kg/8 hr

Quality Assurance

Premix Control Records

TO VERIFY THAT PREMIX IS BEING ADDED AT CORRECT LEVELS USING INVENTORY CONTROL SYSTEM.

FORTIFICATION PREMIX CONTROL RECORDS

FORTIFICATION PREMIX

A	STARTING INVENTORY	_____	KG
B	AMOUNT PURCHASED	_____	KG
C	ENDING INVENTORY	_____	KG
D	AMOUNT USED (A+B-C)	_____	KG
E	PRODUCTION OF FORTIFIED FLOUR	_____	MT
F	ADDITION RATE (D*1000/E)	_____	G/MT
G	TARGET ADDITION RATE	_____	G/MT
H	PERCENT OF TARGET (100*F/G)	_____	%

Quality Assurance

Criteria for Assessing Adequacy of Fortification Programme

	Process Indicator	Criterion
Mill or Importer level	% Flour Fortified, claimed	100%
	% Flour effectively fortified	90% minimum
	Internal monitoring	90% minimum
	External monitoring	10-12 monthly checks per mill
Consumer district level	% monitoring sites with adequately fortified flour	90% samples Adequate
	Adequacy of monitoring	Monitoring in 90% of sites

Fortification costs

Capital Costs

- Feeders
 - Volumetric \$4-7,000
 - Loss in Wt \$15,000+
- Installation:
 - 5% of feeder costs
- QC lab equipment
 - \$300

Operating Costs

- Premix Cost \$0.5-\$1.50 per MT flour
- Overhead:
 - 10% of Premix cost
- QC Iron Spot test:
 - \$5.0 per day
- QA Quantitative:
 - \$50 per test

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What do the Mills need from Other stakeholders?

- Technical Support
- Social Marketing Support
- Advocacy Support
- Investment and Financial Support
- Regulatory Framework
- Monitoring Support

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Technical Support

- Premix Technology
- Feeder and Equipment Installation
- Processing
- Quality Control
- Quality Assurance
- Training

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Social Marketing and Advocacy Support

- Consumer Education
- Counter Misinformation
- Promotion of Fortified Foods

Investment and Financial Support

- Capital investment for Equipment costs
- Ultimately the Consumer pays for fortification
- Millers must be able to recover the incremental costs
- Sustainability is the key to success



Regulatory Framework

- Millers must have a level playing field
- Regulations to cover domestic production and imports
- Legal instruments to enforce compliance

Monitoring and Enforcement

- National and provincial governments must have capacity to:
- Monitor Domestic Production and Imports Effectively and,
- Enforce compliance to meet regulations and laws.



Finally

- Millers must be made to feel that they are an important part of a multi sector approach to resolving micronutrient malnutrition.

