FOOD SAFETY AND STANDARDS AUTHORITY OF INDIA

Inspiring Trust, Assuring Safe & Nutritious Food

Ministry of Health and Family Welfare, Government of India

FORTIFIED

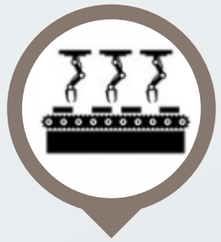
Standard Operating Procedures (SOP) for FRK Production

Fortified Rice is milled rice (of any variety) blended with extruded rice shaped kernels, fortified with essential vitamins and minerals, in the ratio 1:100.

Mixing of Raw Material:

Rice Flour + Vitamin Mineral Premix + Emulsifier/Acid Regulator/Antioxidant + Potable Water

1. Samples of all raw material received in the factory to be drawn and tested.
2. Cleaning of broken rice to remove impurities and dust.
3. Mill the broken rice and reduce the size. Check the milling efficiency (~86%) and moisture level.
4. Pulverization of flour: Conduct pre-operation check of equipment and ensure cleanliness. Sieve the pulverized flour to remove coarse flour from fine rice flour. Ensure the mesh is of the right size.
5. Proper mixing of appropriate quality and quantity of raw material in the mixer is crucial to attain desired quality of FRK to avoid issues like clogging of the mixture machine, lump formation of the flour, colour change of the rice flour etc.
6. Calculated amounts of hot water to be added to raw material mixer for better gelatinization.
7. If some change is visible in the colour, a sample needs to be sent for analysis immediately and the process needs to restart.
8. Keep the premix under strict control of the section in-charge and maintain records about its utilization.



Extrusion of FRK:

Uniform hydrated mixture obtained from mixing is passed through preconditioner, partial gelatinization of starch is done with steam. The hydrated mixture then passes through twin-screw extruder to cook partially and take shape of tiny pallets similar to the shape and size of normal rice grains.

Hot Extrusion is the most critical process of the entire FRK production process. Due consideration should be given to the extrusion parameters like temperature and the rotation speed of cutters.

1. Follow the sequence of starting the packing conveyor first and mixture conveyer/unit at the end and follow the opposite sequence while stopping.
2. The operational parameters need to be set before feeding the raw material.
3. Parameters need to be observed continuously to avoid any variations during system run.
4. Safety features of the system should be evaluated and proper interlocking system has to be in place.
5. The temperature of each zone should be maintained in the specified range.
6. Rotation speed of the cutter should be adjusted to sustain the shape and size of the final rice kernel.
7. Check regularly for burned-out or loose blades and replace immediately.

Drying:

- **Reduces moisture content of final product to 11-12% with stable shape of grains.**
- **Ideal temperature: below 65° C (±5° C)**
- **Retention time: 60 minutes (controlled by the speed drive) or depending on the drier system used.**
- **Ideal Frequency of dryer conveyer belt: 20-22 Hertz**

1. The temperature and speed of the belt should be calibrated before the start of the drying process and maintained.
2. Measure moisture of the output of each belt level. If the output does not meet the given requirements, readjust the flow rate of rice and the temperature.
3. Measure temperature of hot zones every hour. Monitor flow rate every half hour to ensure the texture of kernels is not brittle of perverting the formation of cracks.
4. Operator to start cooling the conveyer before grains start coming out from the dryer,
5. Collect initial product in the rejection bin until the product coming out meets specified quality parameters.
6. Divert product into the storage bin once the quality of the product is right.

Quality Assurance and Packing:

Quality Assessment Report assures the quality of FRK which is then sent for packing.

1. Packing should not start during the process.
2. Ensure that sealing of the inner packing material and stitching of the outer bag are done properly.
3. The final product is packed in a hands-free environment, under hygienic conditions, to maintain its nutrient value and flavor.
4. Each outgoing lot is duly inspected to verify compliance to customer specification and dispatch records are duly maintained.
5. Storage: FRK should be stored at room temperature (25°C or less). Humidity <60% in well ventilated area and away from sunlight. FIFO to be followed. Storage life upto 12 months minimum.
6. Labelling and packaging norms as per FSSAI rules and regulations.

Note:
FRK Premix shall contain: Mandatory vitamins and minerals (Iron, Folic Acid, Vitamin B12) and may contain optional ones (Zinc, Vitamin A, Thiamine, Riboflavin, Niacin, and Pyridoxine)

FLOW OF PRODUCTION PROCESS OF FORTIFIED RICE KERNEL

Fortified Rice Kernel (FRK) is a reconstituted rice grain made from rice flour, vitamins, and minerals using hot extrusion technology.

97% to 98% of Rice Flour

2% to 3% of Premix (Vitamins & Minerals)

These fortified kernels keep the nutrients intact even after cleaning, washing, and cooking.

Raw Material for FRK

The FRK produced should be strong enough to sustain the shelf life and meet the cooking quality of regular rice grains. Major ingredients include:

Responsibility of FRK manufacturer

01 Develop plant specific SOP for:
- Process for manufacture of FRK
- Cleaning of plant and equipment
- Testing protocols for in-process and finished goods

02 FRK manufacturers to apply for FSSAI license/registration under 99.5 category.

03 FRK manufacturers do not need to apply for +F endorsement.

04 Ensure receiving Certificate of Analysis (CoA) for each batch of premix received for production of the FRK covering the micronutrient levels and microbiological parameters from an NABL accredited laboratory.

05 It is CoA for FRK with micronutrients and mircobiological analysis needs to be uploaded every 6 months on FOSCOS portal.

06 The lab report of FRK should be demanded 'per kg of product' and not 'per 10 gm of FRK' of product to avoid confusion and maintain uniformity of results. The method of analysis and target standards to be clearly mentioned in the lab report.

07 Two-layer polyethylene and craft paper packaging is advisable to ensure quality of FRK throughout the supply chain.

For any queries write to us at fortification@fssai.gov.in