# An insight into Batter mixes - the mainstay of breading

The following article is a part of FIFP webinars (21<sup>st</sup> edition) on the topic "An insight into Batter mixes - the mainstay of breading" held on 28<sup>th</sup> may, 2022.

## Note from the Chief Editor:

The main theme of FIFP webinar conducted on 28<sup>th</sup> may, 2022 was "An insight into Batter mixes - the mainstay of breading". Mr Ajit Pillai provided valuable insight into batter mixes and brought out their importance in a battered and breaded product. An increasing demand for battered and breaded products has led to emergence of several such products in the market. Hence, it is necessary to understand the types of ingredients going into these products. The main focus of his presentation was on the coating batter and ingredients of the coating batter mix and their role in making a product crispy, low-oil and having the right texture. He explained salient features of various types of batter mixes and the importance of types of flours and protein content to deliver a quality product. He described in detail the steps involved in breading operation under single line, tandem line, Tempura line and Tempura Japanese line. He also addressed Trouble shooting issues and highlighted the importance of optimum formulation for batter preparation and important factors to be considered.

## Introduction

The 'Battre' is a French word that translates to beat. It is commonly classified as drop-batter, pour-batter and coating-batter. Modern batter mixes are a replacement to mother's milk and egg-dip. Batters consist of a suspension of dry ingredients (in water) used to coat a product and create a base for adhering the next layer of bread crumbs. Batters are created to overcome challenges in food service and provide crispy and low-oil product to both retail and food service.

## What is a batter mix?

A dry batter mix consists of 80-90% flour, rice, corn, soy and potato. Tapioca flour may be added for special effect. Starch levels of 5-30% of dry mixture are common. High-speed production lines require higher starch in undercoating. Hydrocolloids help suspend the flour particles and ensure consistent viscosity and prevent moisture migration and consequently reduce oil pick-up. Gaur gum, xanthan gum, methylcellulose may be used. Baking soda is the leavening agent which when comes in contact with water releases  $CO_2$  bubbles which helps create a 'light' product. They help the substrate 'breath' and prevent blowouts when frying. Addition of small amounts of acid like buttermilk heightens the above effect.

## Types of batter mixes

Adhesion batter mix, cohesion batter mix and tempura batter mix comprise the main types of batter mixes. Certain variations like beer batter mix, buttermilk batter mix, thin adhesive batter mix etc. also exist.

### Adhesion batter

Adhesion batters are designed to adhere to substrates. They are mostly starchbased with high solid content with a viscosity of 9-12 seconds/stein. The type of starch is selected according to the drying rate and line speed. The hydration ratio of solids to water is 1:1.4 or 1:1.9. It is important that the batter dries quickly so that a significant amount stays on the substrate as the support layer without allowing the bread crumbs to soak up the excess water.

#### **Cohesion batter**

Cohesion batter is designed to form a shell around the substrate. It is flour-based with high viscosity and moderate solid content. Hydration ratio of solids to water is 1:1.5 or 1:2. The longer drying time and high viscosity (28-30 secs/stein) helps cement bread crumbs to the batter base.

#### Tempura batter

These are basically cohesion batters with significant number of leavening agents. It is a mixture of flour and starch with high viscosity and high solid content (45 secs/stein). Addition of corn flour and leavening agent creates a puffy texture on frying and also acts an emulsifying agent. Hydration ratio is 1:1.0 or 1:3. It is sensitive to overmixing and pumping. Applied by dipping or submerging.

CONSTITUENT	TYPE	SOURCE
POLYSACCHARIDES	FLOUR	WHEAT, RICE, MAIZE, CORN
	STARCH	WHEAT, CORN, RICE, MAIZE, POTATO & MODIFIED STARCH
	CELLULOSE	METHYCELLULOSE DERIVATIVES
	GUMS	GAUR, XANTHAN, ALGINATES
PROTEIN	CEREAL	GLUTEN
	DAIRY	WHEY PROTEIN
	OTHERS	SOYA ORITEIN, EGG POWDER
LEAVENING AGENTS		SODIUM BI CARBONATE
SUGARS		SUCROSE, DEXTROSE, LACTOSE
ACIDULANTS		DERIVATES OF CITRIC ACID
		PHOSPHORIC ACID & TARTARIC ACID

#### Batter mix components

## Flours in batter mixes

Different types of flours are used in batter mixes like wheat flour, bread flour, rice flour, corn flour, chickpea flour, root flours etc. Most batter systems use on an average 3 types of starch. Higher amylose starch are better film formers. Higher the protein content (gluten), greater the absorption of water and fat and hence chewier and oilier the crust.

### Leavening agents

Leavening agents are used to create a texture. They increase the volume of the product and make the coating less dense. They allow the substrate to breathe preventing blow outs. Sodium-bi-carbonate, sodium acid pyrophosphate, sodium aluminum phosphate release carbon dioxide on hydration. The rate of release depends on the acid used, bicarb granulation, temperature and time.

#### **Gums and Cellulose**

Xanthan gum and Guar gum, Alginates, Carrageenan (0.5% dry weight) are used with low-solid and low-viscosity batter. Methyl Cellulose derivatives- Carboxy Methyl Cellulose (CMC), Hydroxy propyl methyl cellulose (HPCMC) are barrier formers. They increase viscosity and forms gels on frying, thus reducing fat absorption. About 2.5% CMC usage is common.

#### Proteins

Proteins used are Soya Protein Isolate (SPI), Whey Protein Isolate (WPI)and Egg albumin. Egg protein aids in structure formation, adhesion and act as thickeners. Seed protein assists emulsion stability, adhesion, and fat and water absorption. The 3% SPI resulted in high viscosity and breading pick-up. The WPI strengthens structure, prevents moisture loss and enhances colour and flavour. The 3% WPI resulted in crunchy product, good colour and low oil pick-up.

INGREDIENT	ADDITION RANGE %
WHEAT FLOUR	30-50
CORN FLOUR	30-50
SODIUM BICARBONATE	UPtO 3
ACID PHOSPHATE	Adjust, based on neutralizing value
OPTIONAL	
RICE/SOY/MAIZE FLOUR	0-5
OIL	0-10
DAIRY POWDER	0-3
STARCH	0-5
GUMS,COLORS, EMULSIFIER	< 1
SALT	Up to 5
SUGAR	0-3
FLAVORING/	Depends on taste, flavour

#### Typical batter formulation

## **Batter preparation**

Batter must be homogenous, have good flow and should not separate. Ratio of dry batter mix and water is considered intrinsic and temperature extrinsic. Water temperature 10-15°C to prevent gluten formation and too much water absorption. If separation is noticed, gentle mixing is required. Use fresh batter as far as possible. Manual/ Semi-automatic mixers with viscosity meters and temp control mechanisms are available.

#### Flow diagram of a breading operation



## Addressing trouble shooting issues

Major trouble shooting issues and mitigation measures are as follows:

Excess or insufficient pick-up: Control viscosity of batter.

Marriage /Doubles/ Clumping: Control distribution of substrate, belt speed and viscosity.

Blow outs: Check leavening agent in batter mix.

Flares and Tails: Control viscosity of batter and air knife to prevent too much batter on the substrate.

Ballooning/Pillowing on Frying: Control viscosity (batter too cohesive). Use fats/gums and medium pre-dust to increase porosity of batter. Using larger bread crumbs prevents excess batter on the substrate.

Baldness/ Holiday: Control the air knife, viscosity, speed of line, overloading of the system to avoid gaps in the batter layer on the substrate resulting in bald spots on the product.

Peeling crust/ shelling: Control moisture in the substrate by drying in a pre-cooler, use pre-dust and appropriate batter viscosity and excessive pre-dust also causes shelling.

## Additional relevant information

Pick-ups: Pre-dust 5-7%, batter 15-18%, bread crumbs 10-12%

Pick-up calculation: 71-gram substrate weighs 92 grams after breading, hence pick up is (92-71)/71 \* 100 = 28.49%.

USDA food laws define any product above 30% pickup as 'fritters'.

Adding or increasing corn starch will increase crispiness and decrease puffiness in batters.

Thumb rule formulation: For best crispiness results, 10-20% by weight starch, 0.1 - 0.3% gum and leavening agent 0.5-1.5%.

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Sri Ajit Pillai, former General Manager of Al Kabeer Group unit at UAE started his career in Southern Seafoods (ECMP) Vizag /Kakinada/Kolkata. Later he oversaw management of a fleet of 23.5 meters deep-sea fishing trawler. Subsequently, a tenure with Waterbase Nellore and ITC Vizag before moving to the Middle East where he worked for over two decades and retired as General Manager of Al Kabeer Group UAE.

