



Food Solutions

Solutions Designed to Reduce Oil Pick-Up in Fried Foods



Who says we have to leave out delicious things in life?

Dow Food Solutions offers solutions to help reduce the caloric content of fried foods. Simply adding WELLENCE™ Smart Fry to a batter or coating system can help provide 30 to 50% fat reduction in the final fried product, with minimal impact on the texture or sensory profile.

WELLENCE™ Smart Fry in coated meat, meat products and meat analogues

WELLENCE™ Smart Fry is a new range of cellulose-based gums designed to help reduce oil pick-up in fried foods.

WELLENCE™ Smart Fry products were specially designed for this application and offer improved properties like **hydration rate** and **ability to form films**.

Benefits that can be Expected from WELLENCE™ Smart Fry

Properties	Benefits
Film forming ability - insolubility to oil	Barrier against oil absorption during frying steps resulting in a lower fat product
Film forming ability - insolubility to <u>hot</u> moisture (during frying or baking)	Barrier preventing loss of moisture from the substrate: <ul style="list-style-type: none"> • Potentially improved final yield • Juicier, tastier substrate • Helps maintain a crispier coating
Thermal gelling	Improved adhesion properties resulting in an intact and rigid coating throughout production and through to the end user
Specific particle morphology	Improved hydration behaviour that leads to enhanced barrier properties
Cold viscosity	Replace any other currently used hydrocolloid (such as guar or xanthan) and still ensure the right batter pick-up

How does WELLENCE™ Smart Fry work?

WELLENCE™ Smart Fry forms an impermeable film (upon heating) as part of the coating to function as an oil barrier. As a general rule, WELLENCE™ Smart Fry needs to be applied to the outermost layer of the coating: batter or breader or via a WELLENCE™ Smart Fry dip solution. A good hydration or activation of WELLENCE™ Smart Fry also needs to be ensured. As WELLENCE™ Smart Fry is based on methyl cellulose technology, water temperature will have to be below 10°C.

There are several options to use WELLENCE™ Smart Fry as part of batters or coating systems:

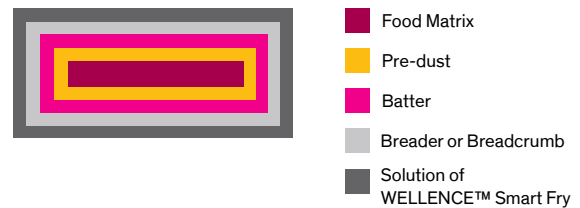
Predust/Batter System

WELLENCE™ Smart Fry in the batter (blended with dry ingredients and then mix added to cold water)



Predust/Batter/Breder System

Additional coating step with a clear coat of WELLENCE™ Smart Fry solution



Predust/Batter/Breder System

WELLENCE™ Smart Fry blended with breder or breadcrumb (followed by cold water dipping step to hydrate WELLENCE™ Smart Fry **or** resting time (8-15s) to allow WELLENCE™ Smart Fry to hydrate with moisture coming from batter)



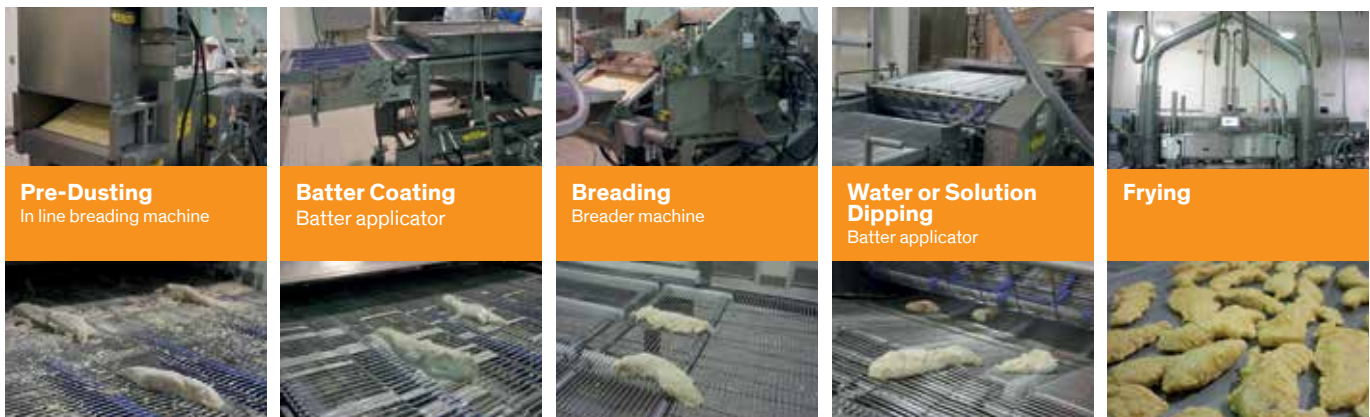
Reformed System

WELLENCE™ Smart Fry is added into the matrix



Application Example: Smart Fry in Breaded Chicken Tenders

In April 2015, independent scale-up trials were conducted at JBT (one of the largest fried food equipment manufacturer in the USA) to produce reduced-fat breaded chicken tenders.



Method 1:
Addition of WELLENCE™ Smart Fry 500 in the breader (via a dry mix)

Dosage:
10% in the dry mix with the breader or bread crumbs
(= 1% in the final product)

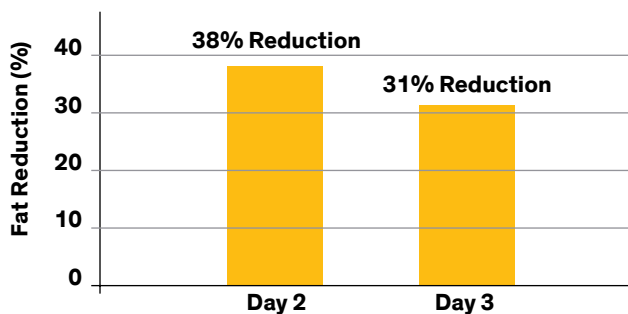
Hydration method:
Once the chicken tender is coated (predust + batter + breader containing WELLENCE™ Smart Fry), it is dipped in very cold water (~7°C) bath for 4-5s.

Method 2:
Addition of WELLENCE™ Smart Fry 60 through an additional clear coat

Dosage:
1% in the clear coat solution (= 0.1% in the final product)

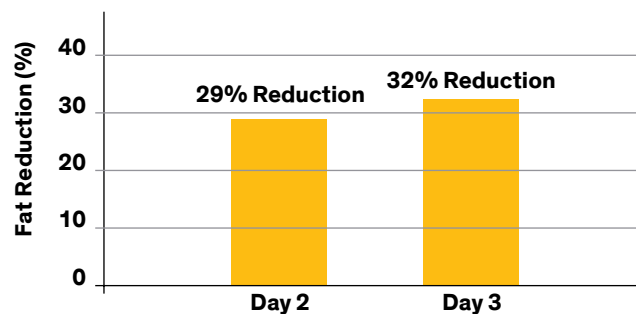
Application:
Once the chicken tender is coated (predust + batter + breader), it is dipped in the clear coat solution (containing WELLENCE™ Smart Fry 60) for a few seconds.

10% WELLENCE™ Smart Fry 500 in breader



Day 2: 1% WELLENCE™ Smart Fry 60 in final product
Day 3: 0.8% WELLENCE™ Smart Fry 500 in final product
(lower dosage due to lower breader pickup) → breader pickup can be adjusted in processing by breader seeding

1.05% WELLENCE™ Smart Fry 60 in dipping solution or clear coat



Day 2 & 3: 0.11% WELLENCE™ Smart Fry 60 in final product

Both methods were repeatable across trials and yielded approximately a 30% fat reduction measured with soxhlet, or more, after finish frying of the chicken tenders. Fat reduction level was correlated to WELLENCE™ Smart Fry dosage and to film regularity, which is enhanced with method 2 (even at lower dosage).



Control



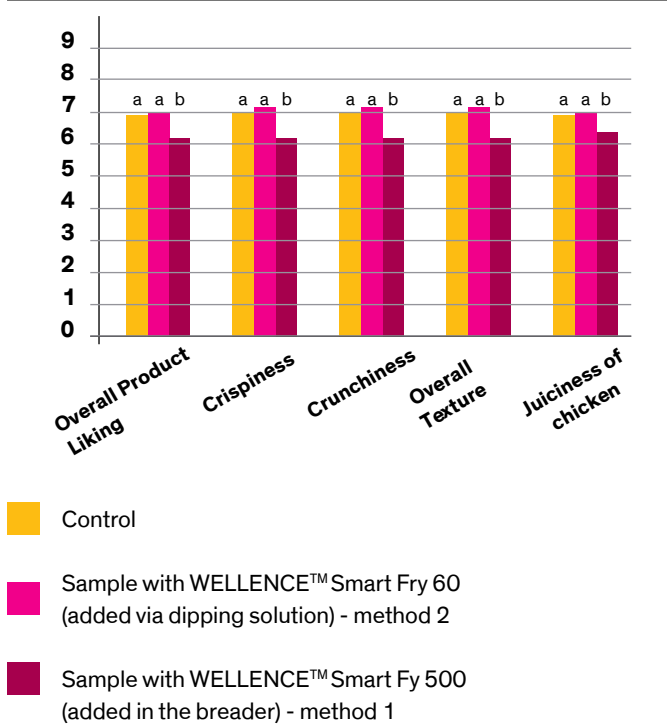
Method 1: WELLENCE™ Smart Fry 500 in the breader (1% in the final product)



Method 2: WELLENCE™ Smart Fry added through dipping solution (0.11% in the final product)

Sensory analysis testing was also conducted with a panel of 150 people who evaluated 5 attributes with a 9 points hedonic liking scale.

Results of the hedonic test



Sensory analysis showed no significant difference between control and samples prepared with method 2 (WELLENCE™ Smart Fry added via dipping solution). However, it is noticeable that chicken tenders prepared with method 2 (31% fat reduction) rated highest or equal to the control against all attributes.

Control and method 2 samples (WELLENCE™ Smart Fry 60 solution dip) were liked significantly more than method 1 samples (WELLENCE™ Smart Fry 500 in breader) for all attributes.

Other Possible Application

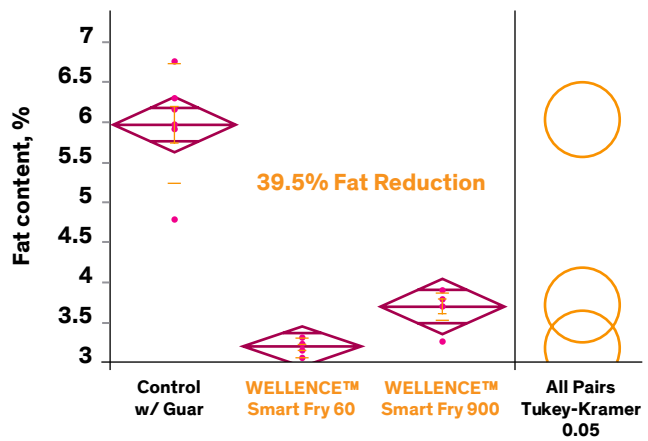
WELLENCE™ Smart Fry can also be used in tempura / batter coatings with different substrates including fish, poultry, shrimp, onion and vegetables.

In the example, the control tempura batter contained 0.3% of guar gum. The guar gum was replaced either by WELLENCE™ Smart Fry 60 (1%) or 900 (0.8%).

The dosage difference can be explained in two ways:

- WELLENCE™ Smart Fry grades are less viscous than guar so a higher dosage is necessary to achieve right batter viscosity and pick-up
- A minimum amount of polymer is needed to form a regular, homogenous film or barrier in the coating

Fat content comparison of WELLENCE™ Smart Fry 60 vs guar in battered tempura chicken (lab data)



Par-frying 360°F/182°C, 35s
Finish-frying 360°F/182°C, 4 min



Control with Guar Gum



WELLENCE™
Smart Fry sample

Conclusions

All grades of WELLENCE™ Smart Fry help reduce up to 30% or more fat and calorie in fried food and enable lower fat claims.

The recommended product for each end application is summarized in the table below:

Recommended product	Target applications	How to apply	General properties
WELLENCE™ Smart Fry 900	Reformed vegetable products and battered products	<ul style="list-style-type: none"> • Applied directly to food matrix • Added to batters or tempuras via dry mix 	<p>Low temperature process needed to ensure full functionality ~ 7-10° C</p> <p>Improve final yield and juiciness of the food substrate for a better eating quality</p> <p>Reduce blow off and rupture of coating – better stability during frying</p>
WELLENCE™ Smart Fry 500	For breaded / battered fried products	<ul style="list-style-type: none"> • Recommended for application in breadier / breadcrumb • Applied directly into breadier via dry mix • Cold water bath needed for post dipping to ensure activation of WELLENCE™ before frying 	
WELLENCE™ Smart Fry 60	<p>For clear coat application on breaded products</p> <p>Or</p> <p>included in battered/tempura coated products</p>	<ul style="list-style-type: none"> • Recommended for clear coat or solution dipping techniques <p>Advantages of these methods:</p> <ul style="list-style-type: none"> - Improved crispiness and crunchiness versus WELLENCE™ Smart Fry 500 - Lower dosage required = lower cost in use <ul style="list-style-type: none"> • Added to batters or tempura via dry mix. Lower viscosity than WELLENCE™ Smart Fry 900 	

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