THE INVISIBLE FOREIGN BODY THREAT!

THE PLASTIC MENACE

Plastic, wood, pits and more can now be detected! A Food Safety production from Food Radar Systems
Fighting the “invisible”
Detecting the “invisible”
Detecting the invisible

Low density foreign bodies in emulsions and pumpable products
Benefits & risk protection

- Consumer injury
- Legal issues and claims
- Brand issues
- Recalls
- Quality improvements
"With increasing use of plastics in everyday applications and the difficulty of detecting them on-line, many food companies regard plastics as one of the most important causes of foreign body complaints."

Dr. Mike Edwards
Microscopy Section Department of Chemistry and Biochemistry
CAPDEN BPI
Is Food Safety on your agenda?

Food recalls in the US alone cause $77 billion — costly in more ways than one.

*Food Production Daily*
*April 2014*
X recalls 75,320 pounds of chicken nuggets

X Foods is voluntarily recalling 75,320 pounds of frozen, cooked chicken nuggets after consumers reported finding plastic contaminants in the food.

Food recalls in the US alone cause $ 77 billion – costly in more ways than one
Mission

Food Radar Systems will provide increased product quality and safety for the Food Industry by developing, marketing and selling a non invasive in-line system capable of detecting foreign bodies in Food that existing systems don’t capture.
Existing Technologies

- X-Ray
- Metal detector
- Vision system

FRS offers what no other company does sensors based on microwave technology for the food industry
**Metal Detector:** metal capability

**X-Ray:** competent in detecting glass, stones and metal

Has capacity to detect smaller metal & stones than a Food Radar **but nothing else**

**Food Radar** can in addition detect important low density foreign bodies with a focus on plastic and organic defects
Detecting both high & low density objects

High density – sinks in water
Low density – floats in water
Low density foreign bodies

Wood        Alufoil       Rubber    Hard plastic  Soft plastic  Silicon  Cherry pit
Fruit preparations with pits and fragments

Fruit fragments can be as sharp as glass
Organic defects
Detecting insects
Our "radar sector"

- Magnetron
- Voltage controlled oscillator - VCO

MICROWAVE "NEAR FIELD SCANNER/RADAR"
MW vs. X-RAY

MICROWAVES spreads spherically

X-RAYs spreads in straight lines
The electromagnetic microwave

- Microwaves used in the Food Radar between 2.0GHz and 3.0GHz.
- Up to 3 000 000 000 waves every second!
- Wavelength in vacuum around 100mm, in water around 10mm.

\[ \lambda = \frac{c_0}{f \cdot \sqrt{\epsilon_r}} \]

\[ c_0 = 299 792 458 \text{ m/s} \]
NO dangerous radiation

1000 times lower output power than a mobile phone

1,000,000 times lower output power than a microwave oven
Analogy with light waves

“LIGHT REDUCTION” RESULTING FROM:
“LOSS THROUGH MEDIUM”

ANGLE RESULTING FROM:
“REFRACTIVE INDEX (SPEED OF WAVE THROUGH MEDIUM)”
Looking through the microwave glasses
Dielectric variation inside the pipe
Raw vs. boiled

THE MICROWAVE VIEW

RAW CARROTS

BOILED CARROTS
Detection vs. pipe size

Same object size in three different pipe sizes.

Smaller pipe diameter gives better detection!
Sensor Unit and Reject Unit
Sensor with protective cover
Sensor pipe with antennas
Microwave frequencies

Measures at between 6 and 8 microwave frequencies for each antenna direction.
Adaptive threshold
Detect
From detection to rejection
Two detector cells

CELL A

CELL B

130m
Timing in the sensor
The Food Radar measures the object speed. Independent on bulk flow speed.
Buffer pipe

BUFFER PIPE LENGTH
VERY IMPORTANT!

DO NOT change the length without consulting Food Radar Systems

DO NOT place any sensors or probes in this pipe
Dynamic reject time

Safety distance before object (flow speed dependent)

Safety distance after object (flow speed dependent) (longer to handle turbulence during valve transition)

Opening time

Closing time

Object length (variable)

Total time
Close to our customers
“The bubbles go up”
The Food Radar can detect FB in

- Soups
- Fruit prep
- Baby food
- Table sauces
- Processed cheese
- Wet cooking sauces
- Processed tomatoes
- Minced chicken meat
- Ready meal bases (Lasagna)
- Pasta sauces (Pesto)
- Sausage emulsions
- Seasonings
- Fruit juice
- Dressing
- Spreads
- Yoghurt
Organic material detected and rejected as we started to run the batch. Part of what came from the customer before we had entered any foreign bodies and started the test. Left is 15mm long and right about 7-8mm.
Detection in Mayonnaise

- Rubber
- Aseptic foil
- Scraper
- Wood
- Soft plastic
- Plastic glove
- Hard plastic

Chicken/Bacon Mayonnaise
Cheddar Mayonnaise
Smaller FB than ingredients in pasta sauce/soup
Detecting the invisible
Pilot testing facility
International Food Tec Award

Companies from the international food industry and its suppliers are honored for their commendable innovation projects.

Food Radar Systems received the award 2012

2015 World Food Innovation Award

Finalist in 2015
"At ALSAT we have a strong focus on product safety. As we strive to be in the forefront we identified the unique benefits that the Food Radar technology offers in our production situation. We can now look back on a successful implementation in our diced tomato process."

Miguel Ángel Martin
CEO-Managing Director
ALIMENTOS ESPAÑOLES ALSAT, S.L.
"We find this technology very interesting in helping to eliminate Low density foreign matter, in particular plastics, thereby further ensuring the quality of the product we deliver to our consumers."

- Michael Philp, European Process Improvement Manager, HJ Heinz
"At Emmi we have a strong focus on product safety and have invested in the Food Radar system"

EMMI
Emmen Switzerland
Detecting the invisible

Unique technology solution developed by Food Radar Systems for detection of Low density foreign bodies in emulsions and pumpable products
✓ Safe – 1/1000 the level of a mobile phone
✓ Minor footprint – approx 1 meter of present pipe
✓ Very fast installation time
✓ Ability to detect earlier undetectable materials
✓ Rejects 0.5-2 liters
One additional weapon in the fight against FB