

Challenges in implementation

Steve Brabbs - DuPont ActInPack Meeting - Munich April 2016



The miracles of science™



\* Consolidated net sales from continuing operations.

## **DuPont Protection Solutions**

The global innovation leader in scientifically engineered products & systems that protect lives, the environment, buildings and processes

Products based on high performance fibre technologies

Kevlar <sup>®</sup>	<b>Nomex<sup>®</sup></b>	Tyvek <sup>®</sup>
Protection against impact	Protection against fire	Protection against contamination
Strength & toughness	Heat resistance	Selective barrier
<image/>		

BBC Horizons Episode - https://vimeo.com/112157548



## **Some Tyvek<sup>®</sup> applications**





Protective Apparel



Envelopes



Print Media



Sub-surface Irrigation



Medical Packaging



Wristbands



Agricultural Mulch



Cargo Covers



Homewrap™



Surface Protection



Light Reflectors



Active Packaging

#### **Tyvek<sup>®</sup> - fiber and sheet structure**



- Oriented high density polyethylene = high strength
- Hydrophobic polymer, small pore size = high water barrier
- Flat, rough fibers, high tortuosity = high particle barrier
- Non-toxic ingredients = food contact approved



## **Active (& Intelligent) Packaging Balancing Act**



# **Food safety considerations**

Active Packaging has to comply with:

- EC 1935/2004 directive on food packaging
  - Establishes a 'positive list' of materials approved for use in food packaging
  - Establishes migration limits for substances in food packaging
- EC 450/2009 directive on active & intelligent packaging
  - Establishes a similar positive list for ingredients allowed to be used to create an active effect in a food package
  - Materials not on the list may be used if they are otherwise approved for use as a food ingredient or additive
  - Unlisted materials may also be used if: they are not classified as carcinogenic, mutagenic or a reproductive hazard and they are contained behind a functional barrier
  - Functional barrier = migration <0.01 mg/kg <u>quantification at 10 ppb level</u>?
    - Testing migration with a suitable food simulant <u>compatible with detection?</u>
    - Methods provide a food contact area of 6 dm<sup>2</sup> <u>appropriate for active systems</u>?



### Further aspects of a risk assessment

#### • Mechanical integrity

- Even if the system is compliant, the risks and consequences of leakage have to be considered
- Puncture/tear/abrasion resistance and effects of humidity
- Safety and consumer acceptance both important
- Brand owners are very risk averse
- Functional reliability
  - Must function over a wide temperature/humidity range experienced
    - Not just in ideal or expected conditions
  - Failures will be blamed on the active system, not the environment
  - Retail applications big volumes but less control over use conditions
  - Wholesale better control over conditions but customers will have demanding technical requirements



## **Environmental footprint of active systems**

Paper or plastic?

- Paper has favourable consumer perception
  - Renewably sourced and compostable
  - As opposed to oil-based, non-biodegradable plastics
- Reality is not so simple example for envelopes

	Weight g/m <sup>2</sup>	Prod'n energy use J	Water L	Process emissions	Waste handling
Tyvek®	68	186	0.06	0.01 g hydrocarbon 24.8 g CO <sub>2</sub>	May be recycled
Paper	150	362	1.9	2.8 g chlorinated waste 85.2 g CO <sub>2</sub>	Recyclable or compostable

- Functionality and safety have to be balanced with sustainability
- Have to look at the product lifecycle not just the packaging
- Customers market will not pay more for sustainability
- Plastic materials will all be bio-sourced one day ...
  OPPOP

## **Product development is always a balancing act**

- Which way the scale tips depends on what your customers think is more important
- In a complex supply chain, users at different levels may have different priorities
- Getting that aligned is the biggest challenge



