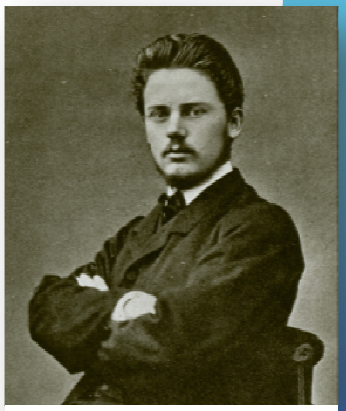
Why x-ray a milk package?

Tetra Pak presentation
Erfa meeting May, 2013

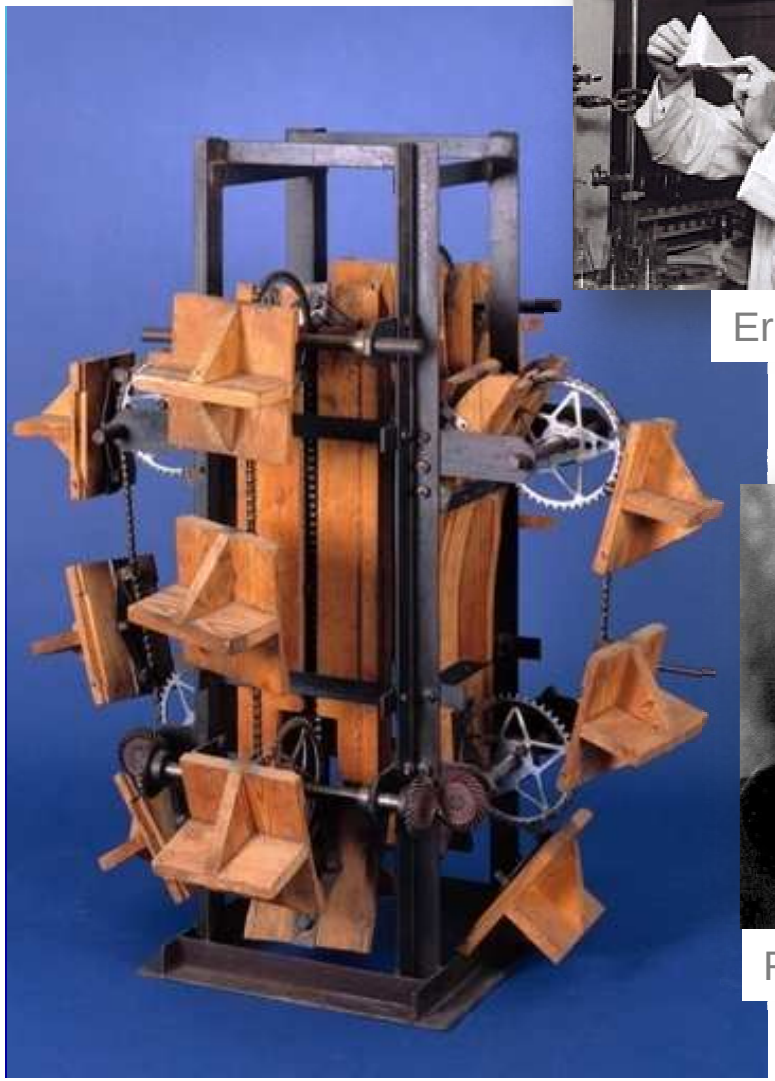
PROTECTS WHAT'S GOOD™

Two basic innovations



Gustaf de Laval

Continuously separating cream and milk



Continuously forming, filling and sealing a tube with milk

Erik Wallenberg

Ruben Rausing

Today Tetra Pak is a system supplier

Packaging & Distribution solutions

The early 20th century

The first Tetra Pak package

Till Patentet N:o 131 599

FIG. 1

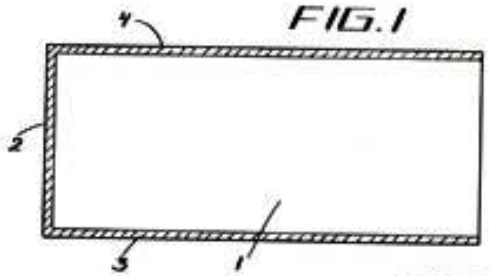


FIG. 2

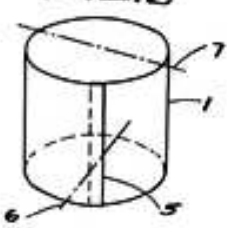


FIG. 3

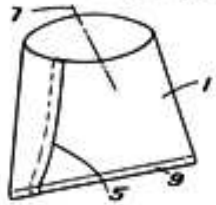


FIG. 4

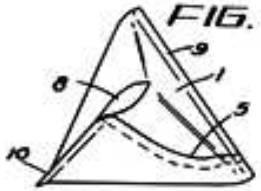
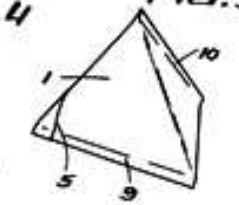


FIG. 5



GENERALSTABENS LITOGR ANSTALT

1952 first Tetra Classic® packaging machine delivery

Our company culture

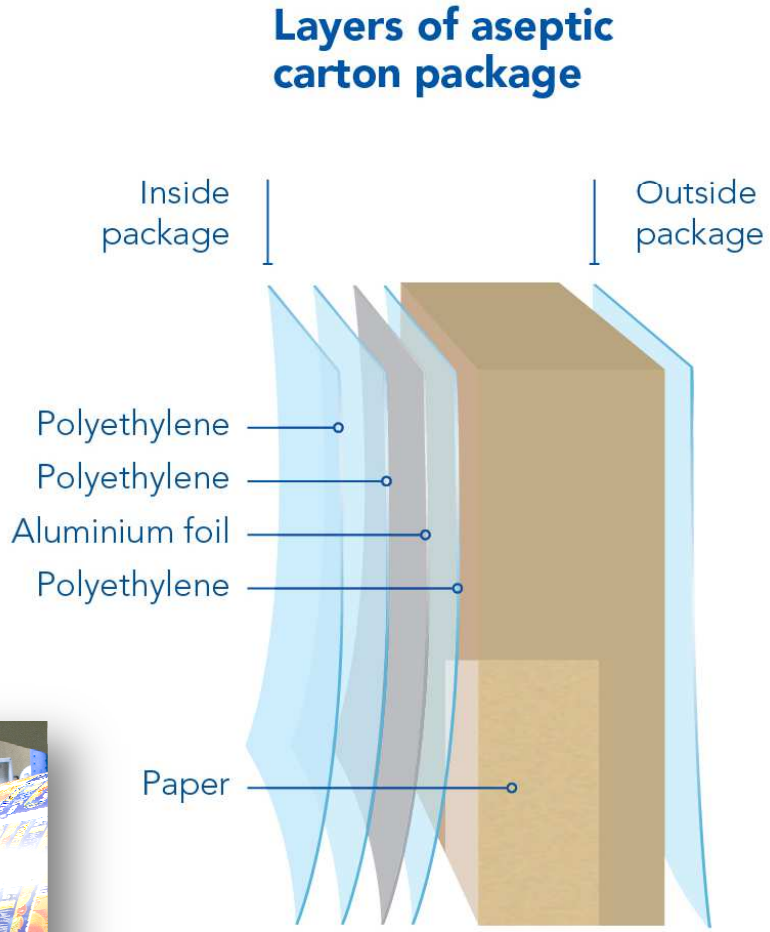
- Family-owned
- Strong culture
- Swedish heritage
- Corporate citizenship
- Environmental responsibility

“A package should save more than it costs”

Aseptic processing technology

- Effective heat treatment
- Nutritional value retained
- Minimal impact on flavour, colour and texture
- Pure product – no preservatives
- Long shelf-life
- Ambient storage

Barrier packaging material



Tetra Pak in the world 2012

Packaging machines in operation	8,708
Packaging machines delivered in 2012	505
Processing units in operation	67,000
Processing units delivered in 2012	1,971
Distribution equipment in operation	17,422
Distribution equipment delivered in 2012	1,721

Number of employees	23,425
Factories for machine assembly	8
Production plants for packaging material and closures	42
Market companies	37
Sales offices	82
Technical training centres	16
R&D units	11

Countries where Tetra Pak packages are available	>170
Number of litres of products sold in Tetra Pak packages in 2012 (million)	77,307
Number of Tetra Pak packages sold in 2012 (million)	173,234
Net sales in 2012 in € million	11,155

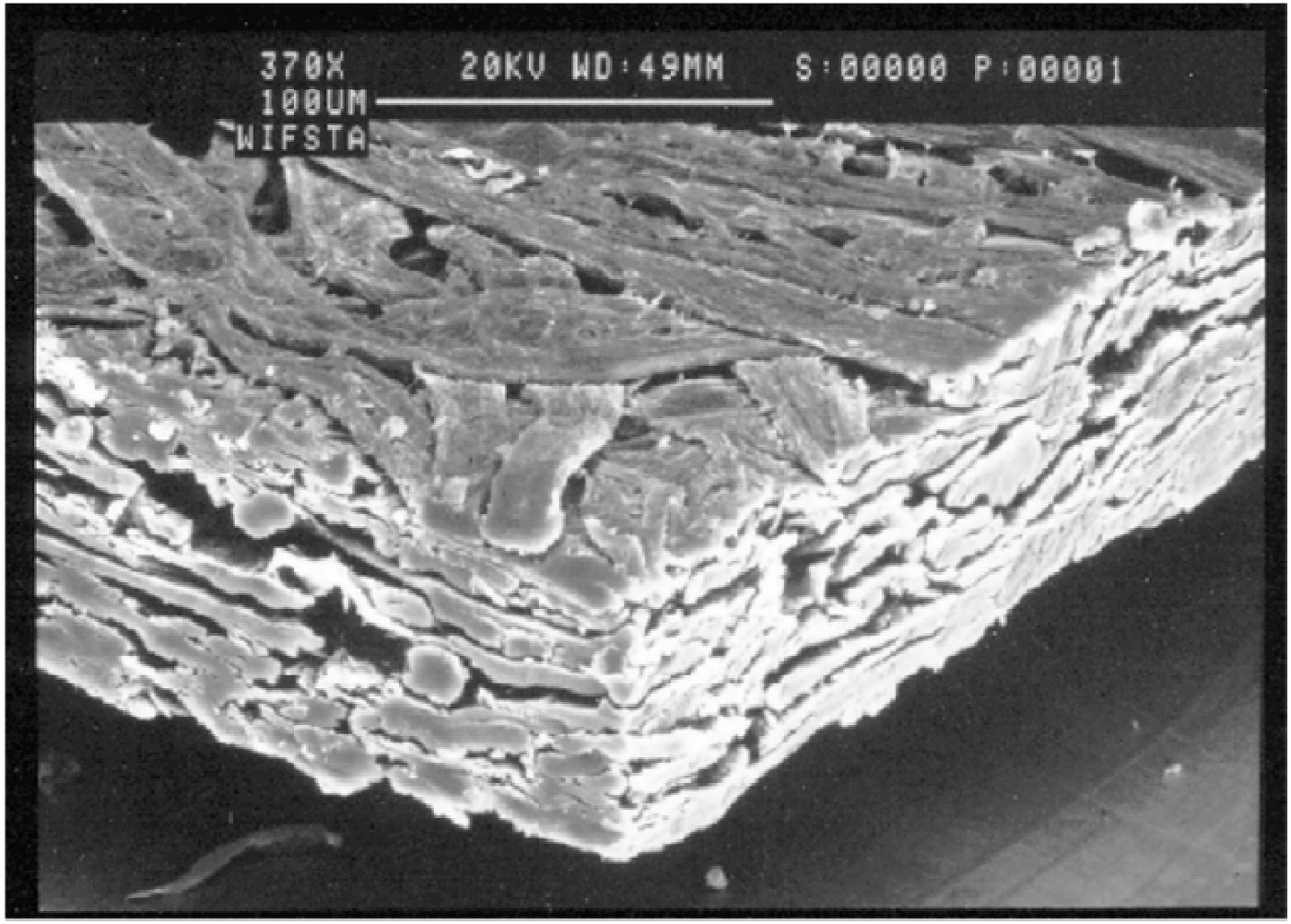
Tetra Recart

Canned food two centuries smarter

The huge potential of unpacked food

But why x-ray a milk package?

1) Move beyond 2D images to facilitate CAD and virtual simulations



Tetra Brik® Aseptic 1000 Slim with HeliCap™ 23

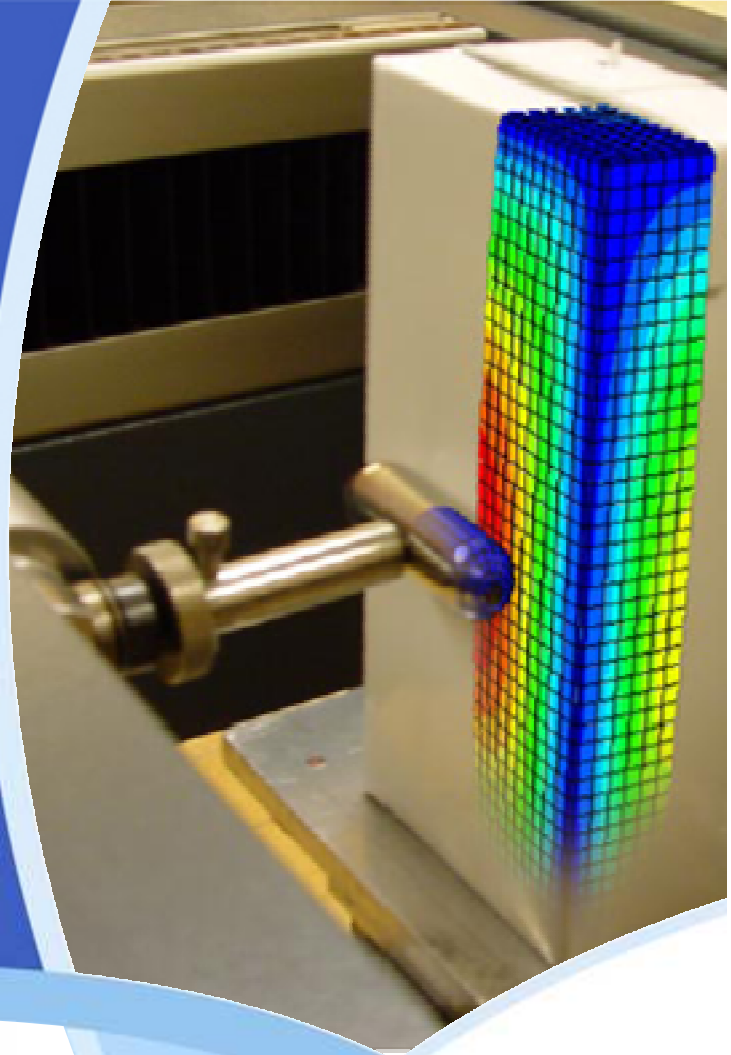
2) Disclose hidden features

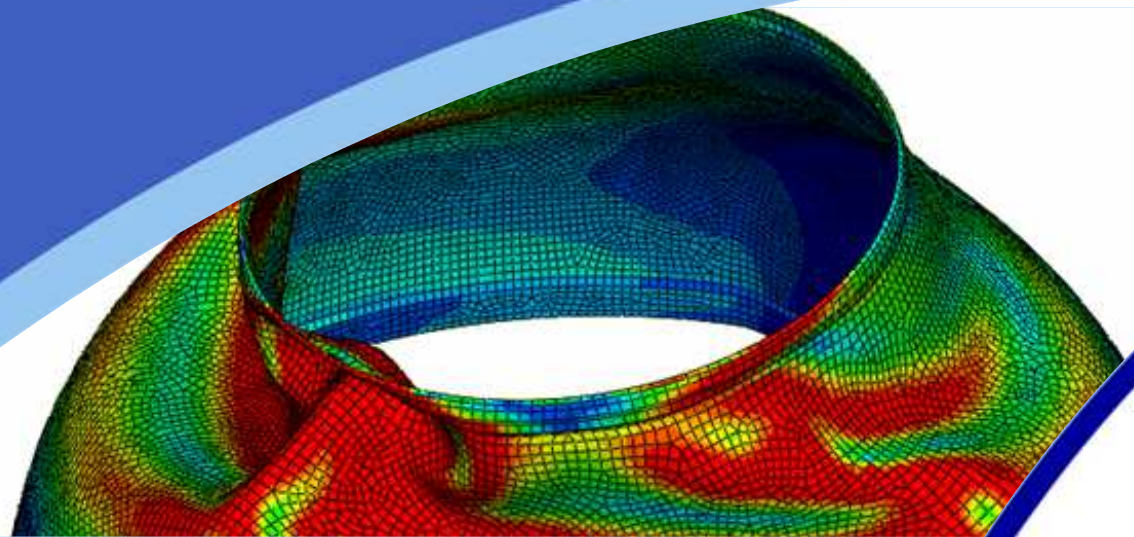
Simulation Driven Package Dev.

X-ray @ Tetra Pak

Erfa meeting May, 2013

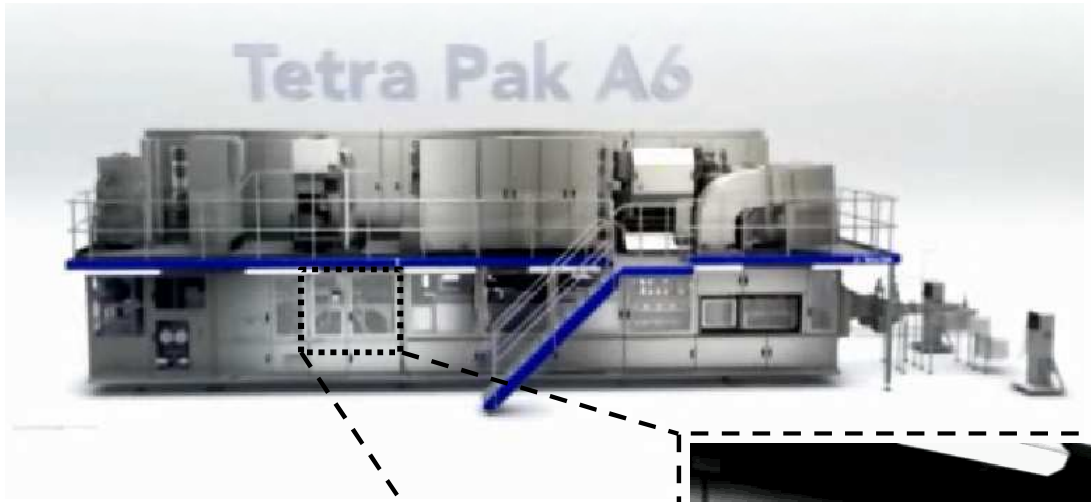
Eskil Andreasson & Viktor Petersson
Tetra Pak

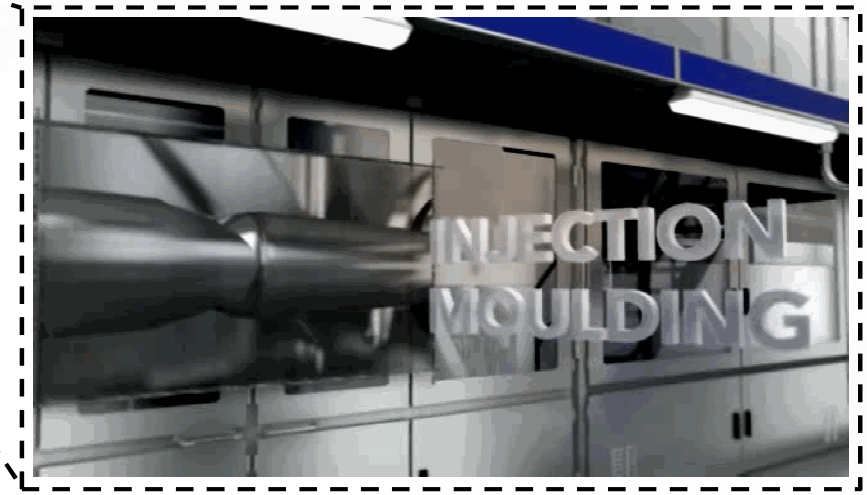




Package production at Tetra Pak

Injection moulding of polymer tops on a carton sleeve





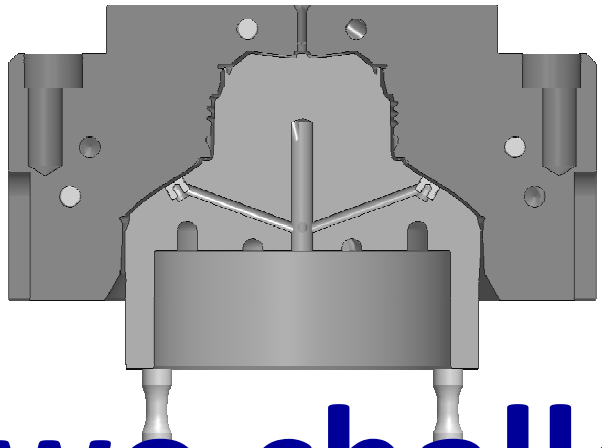
Tetra Pak® A6 - Meet the filling machine for Tetra Evero® Aseptic

Simulation Driven Design

http://campaign.tetrapak.com/life/designing-the-package/

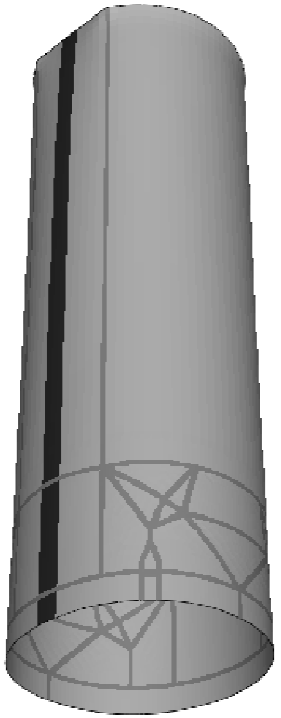
Reference: Viktor Petersson

IM Tool

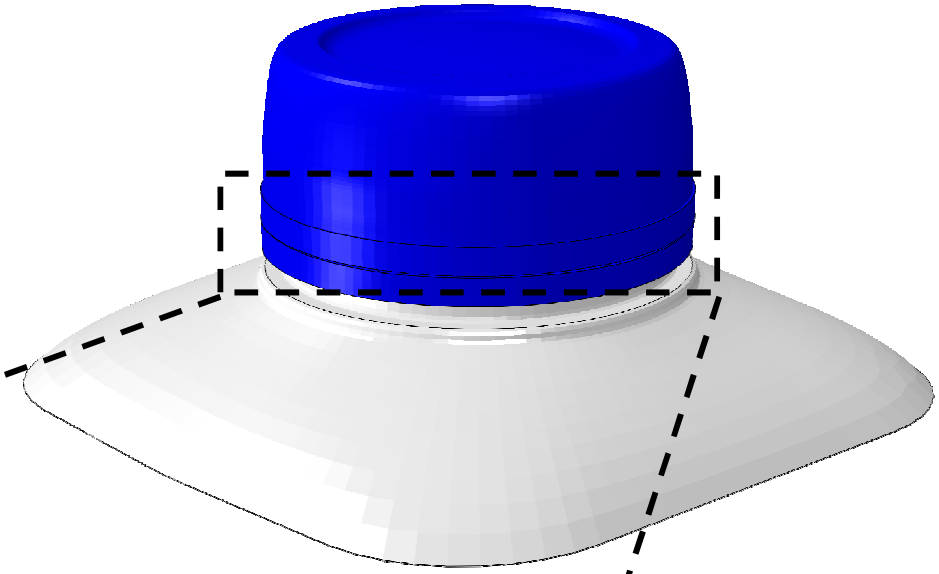


Two challenges!

Bottom folding

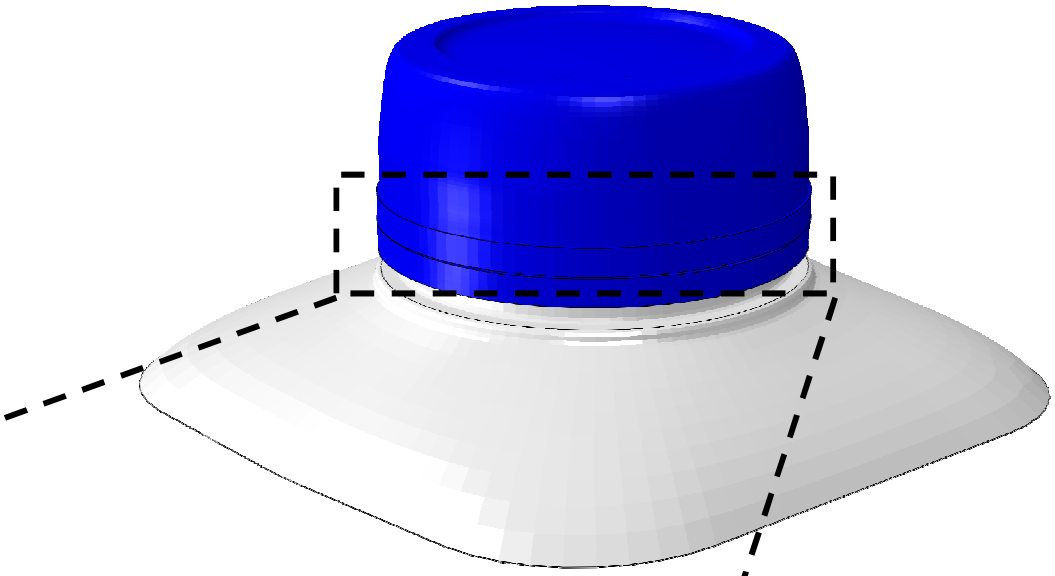


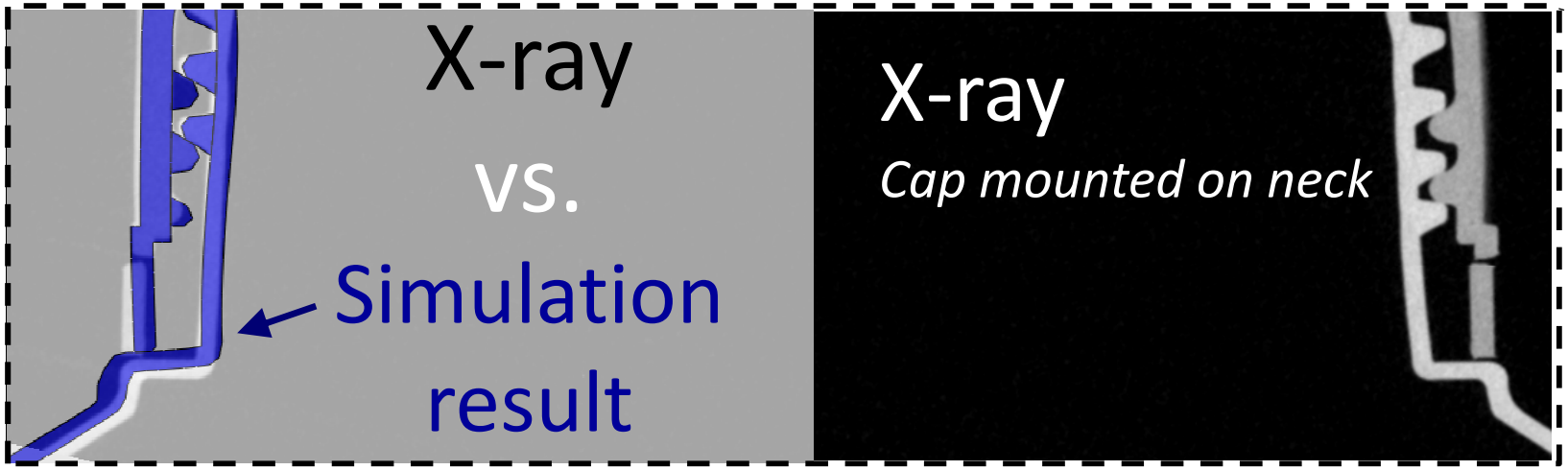
Reference: Andreas Åberg



Cross-section of the polymer cap and neck

We can evaluate “hidden” features!

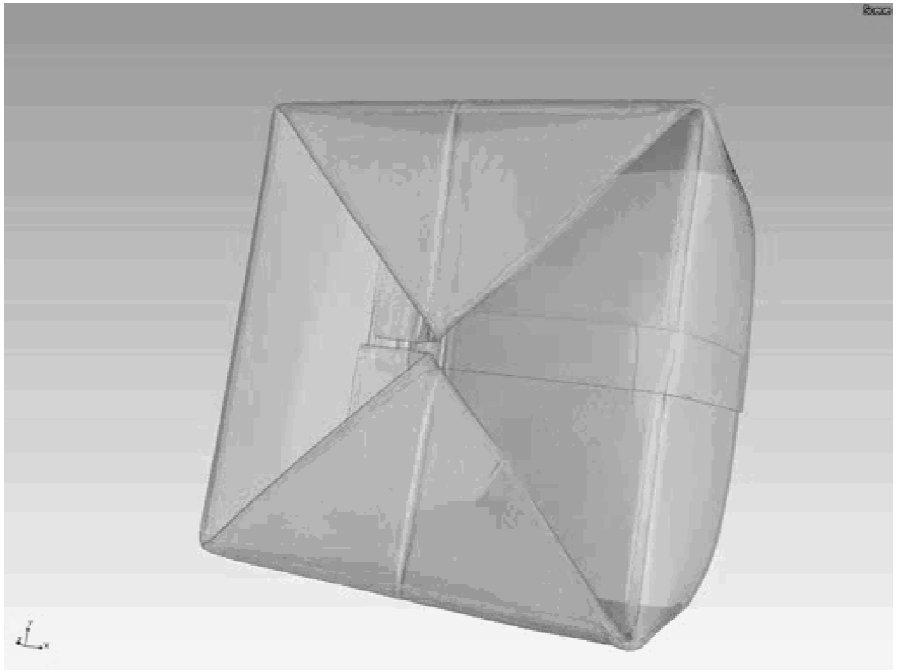




Cross-section of the polymer cap and neck

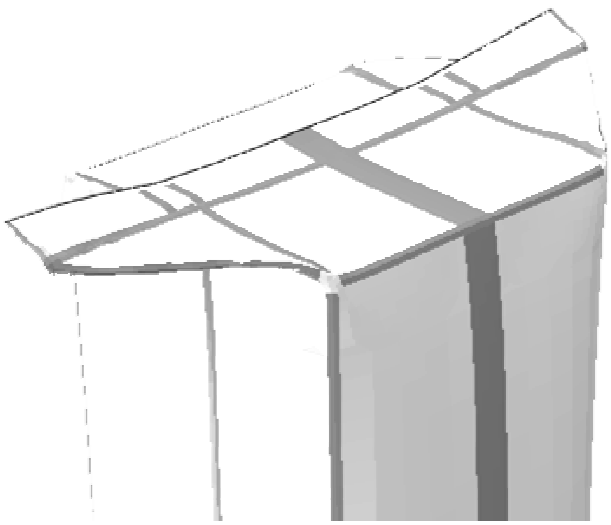
We can verify simulation results!

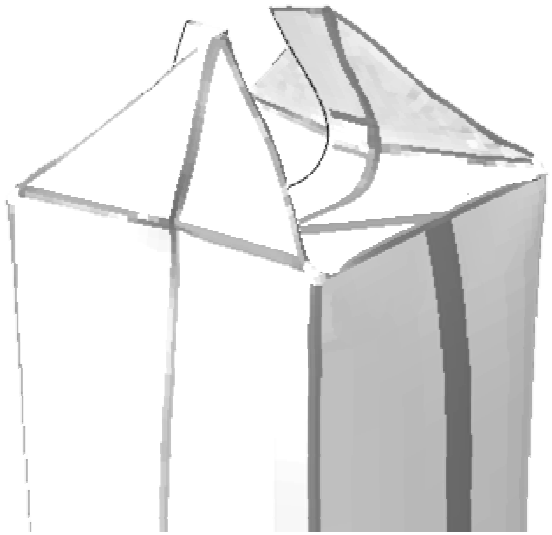
CT-scan of the bottom

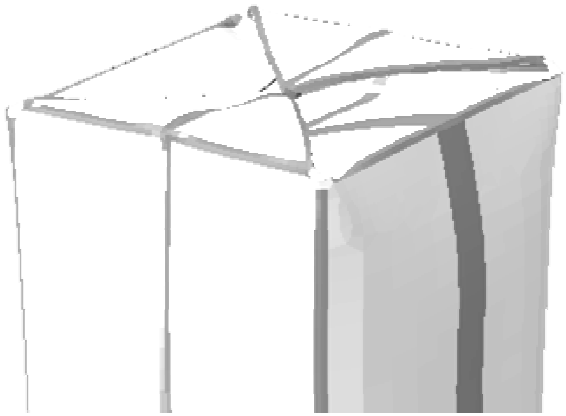


Reference: Maria Holmberg DTI

Tetra Top®







Reference: Andreas Åberg

Virtual bottom folding

Phoenix v|tome|x s @ Tetra Pak

Maximum sample size 16x16 cm
Detector plate 1000x1000 pixels

Reference: Alexander Mirholm

Two separate x-ray tubes

- **240 kV / 320 W high-power** microfocus directional tube (240D)
- **180 kV / 15 W high-power** nanofocus transmission tube (180NF)

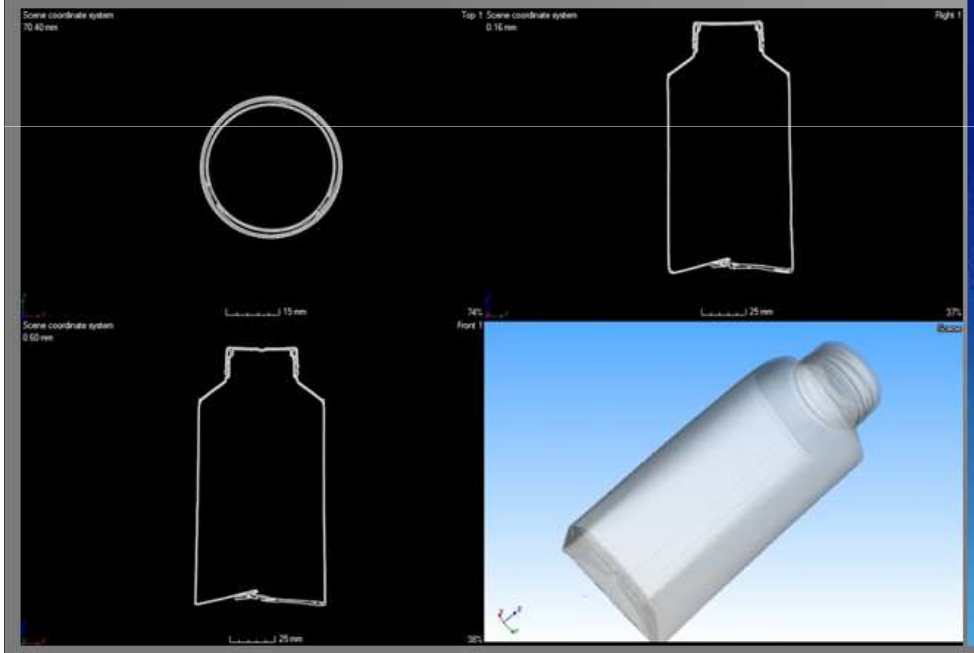
CT Scanning at Metrology and Quality Assurance, Danish Technological Institute

TEKNOLOGISK INSTITUT

Zeiss METROTOM 1500

X-Ray tube:	225 kV
Detector:	1024 x 1024 pixels
Sample size:	30 x 30 x 30 cm
'Detectability':	< 10 µm

Full 3D-scan of Tetra Top package at DTI



Reference: Maria Holmberg DTI

Benefits of using CT-scanning at Tetra Pak

- Non destructive test method, simple sample prep.
- Traditionally we look in 2D (Microscopy, SEM)
  - Three dimensional reality, “cut/look” at samples in 3D from X-Ray
- Evaluate hidden features, interactions etc.
- Compare CAD-model and produced package
- Makes it possible to create real geometry virtually
- Verification of simulation models
- Reverse engineering

CT makes it possible to simulate realistically!


PROTECTS
WHAT'S GOOD™
Tetra Pak