

The DuPont Performance Polymers Laboratory (Elastomers)

DuPont Performance Polymers Conference

May 20th, 2010

Albergo Cocca Hotel

Sarnico (Bg)



The miracles of science™

Patrick Paglia

European Technical Center



- ❑ Outskirt of Geneva
- ❑ 250 people
- ❑ DPP - Elastomers lab : 22 people
- ❑ Technical Support to customers located in Europe & abroad
- ❑ Vamac®, Viton®, Kalrez®, Viton® Free Flow, Neoprene
- ❑ ISO/TS 16949:2009 (Viton®) & ISO 9001:2008 (all products)
- ❑ Yearly Compounder Course – next June 2010

What's unique to ETC

- ❑ Many professionals with multiproduct experience
- ❑ Broadest range of diversity and language skills
- ❑ Central geographical location / time zone
- ❑ Well integrated with the business
- ❑ Well integrated & synergies with DuPont labs

DPP definition of TS&D Lead Center

- ❑ A TS&D LAB with unique or clearly differentiated capabilities within DPE, serving a strategic technology segment
- ❑ Critical mass (staffing, investment, competencies) to provide full service for that technology or market segment world wide
- ❑ Close links and exchanges with other leading, non-competing players active in the same value chain for the technology (for example, mould manufacturers)
- ❑ Ideally geographically close to the main markets
- ❑ Provides support to the other regions

Elastomers lab of the European Technical Center

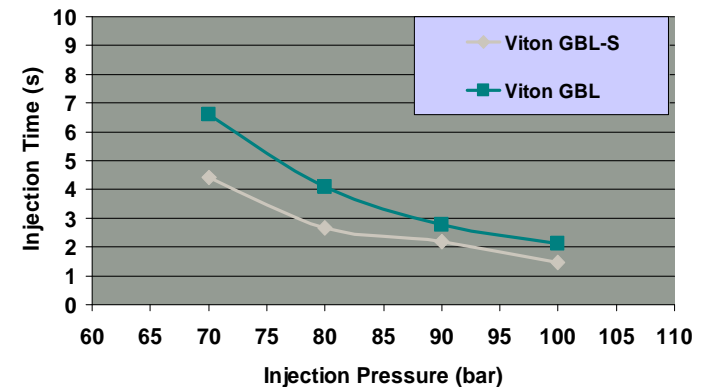
- ❑ Several mills – four (0.5 kg to 15 kg)
- ❑ Internal mixer – two (1.6 liter & 9 liter)
- ❑ Presses for slabs
- ❑ Mooney, MDR, RPA, MTS, Goettfert, Rosand capillary
- ❑ + standard testing equipment (Tensile, TR 10, etc.)
- ❑ Injection moulding machines – three
- ❑ 2K injection moulding machine
- ❑ Oven for post-cure & aging
- ❑ Explosive Decompression Unit
- ❑ Strong analytical capabilities

Injection moulding capability

- ❑ One vertical & two horizontal injection moulding machines
- ❑ Product development beyond conventional rubber lab equipments (RPA, capillary rheometer, etc...)



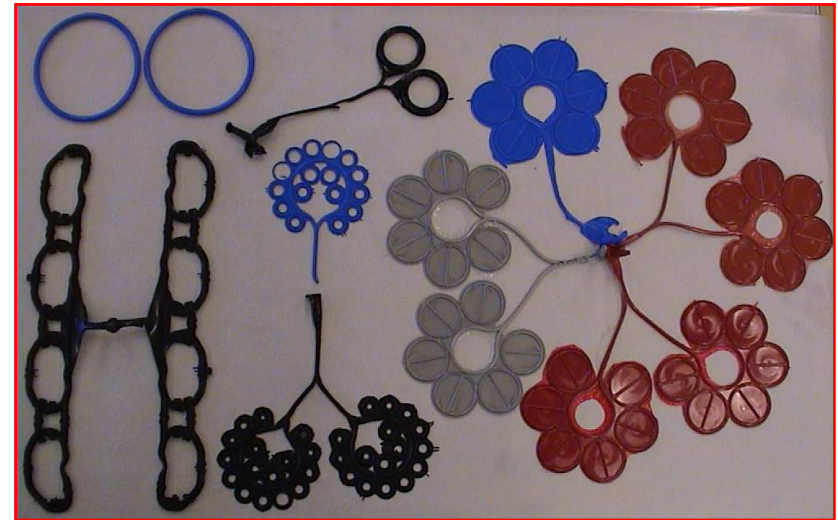
- ❑ Optimisation of custom compounds – flow & release



- ❑ MIR, 135 tons
- ❑ 38 mm barrel
- ❑ Reciprocating screw
- ❑ Essentially o-ring moulds of various part dimensions & surface finishes

Injection moulding capability

□ New entry :



- To cope with broader DPP portfolio
- Maplan, 300 tons
- 27 mm barrel, L/D 13
- Ideal for low volume compounds, e.g. evaluation of experimental polymers
- Quick cleaning for transitions

- O-ring moulds
- Diversification of mould estate :
 - Multiple cavity moulds for broad processing assessments in one go : flow, release, scorch
- Special projects : brush for long runs

Injection moulding capability

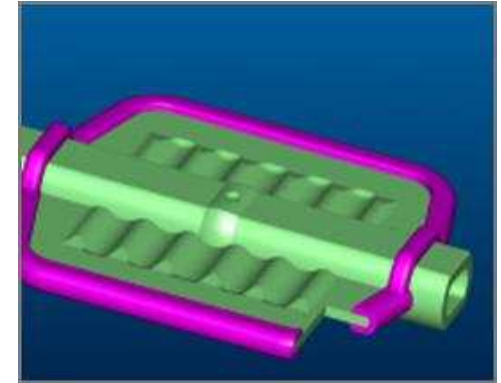
- ❑ Vertical injection moulding machine
- ❑ REP, 70 tons
- ❑ Bonded parts



2K injection moulding capability



Rotary table



Peel sample



Zytel® FE 270056
Vamac® Ultra IP

Optimum process parameters

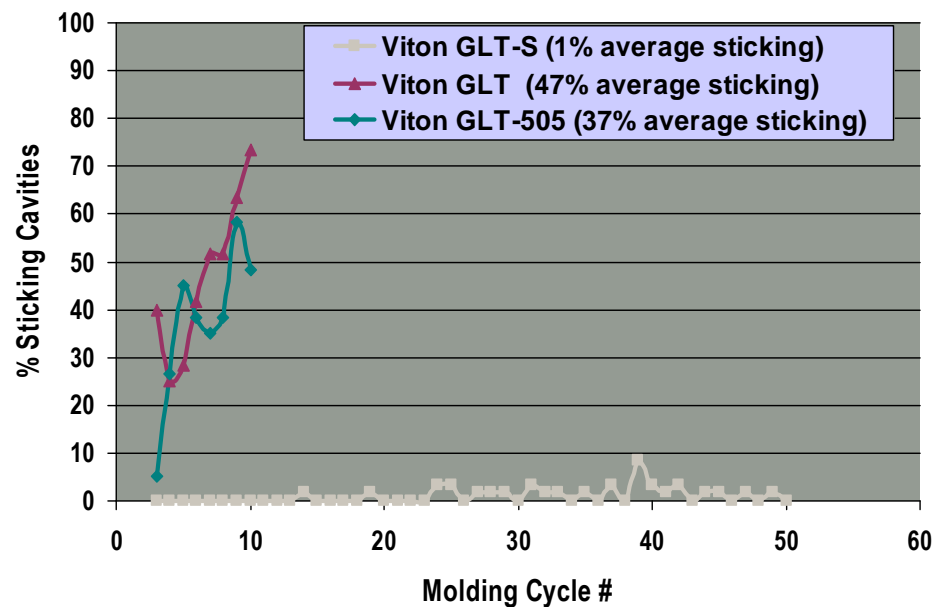
<u>Vamac® cavity:</u>	190°C
<u>Curing time:</u>	45 sec
<u>Post cure:</u>	40min @ 190°C
<u>Total cycle time:</u>	70 sec

Hardness, Shore A:	60
Compression set:	~20 %
Peel adhesion:	>2.5 N/mm

Compression moulding capability



- ❑ Characterisation of new product
- ❑ Determination of best releasing aid package
- ❑ Optimisation of custom compound with emphasis on release performance
- ❑ Complementary to the injection moulding assets

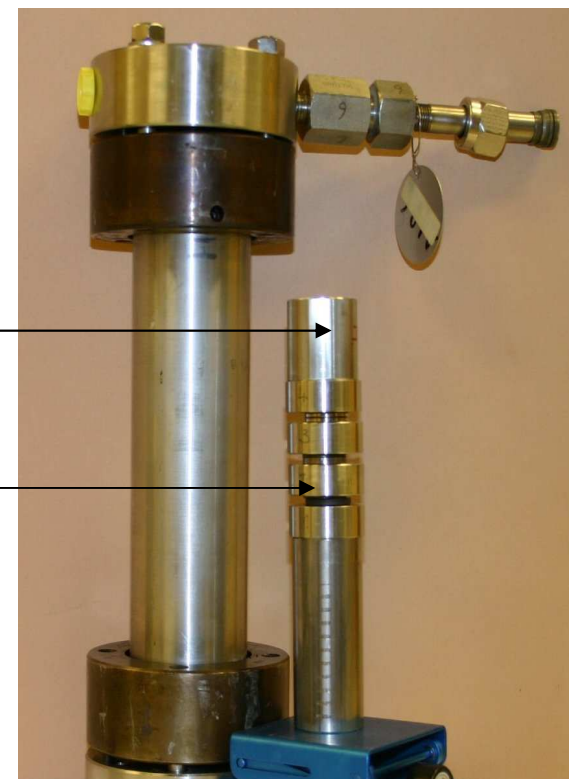


ED testing equipment



Uncompressed
(smaller piece)

To be compressed
(larger piece)



A program developed internally ensures constant data acquisition and optimum pressure release

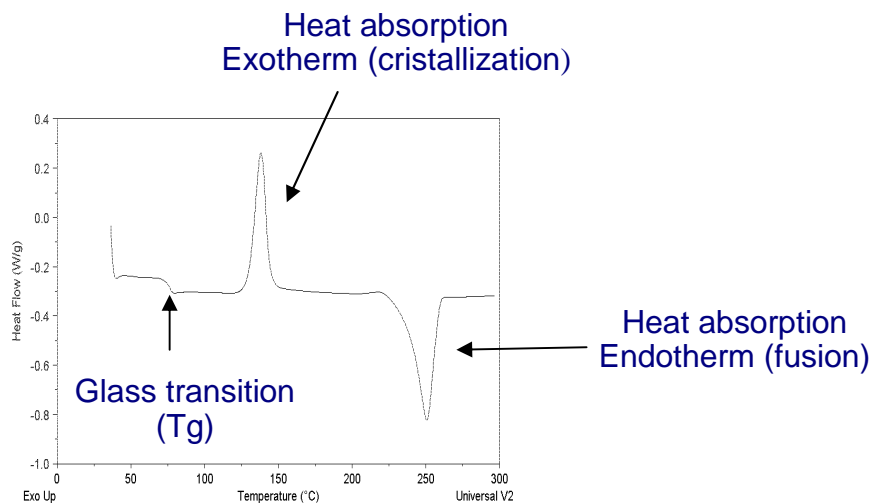
ED testing equipment

- 100 % CO₂
- 24 hour exposure
- Temperature : Room Temperature, 100 °C, 150 °C, 200 °C
- Pressure : 5 MPa, 10 MPa, 15 MPa
- Decompression rate : 2 to 12 MPa/min
- One decompression cycle
- Uncompressed and compressed K-325 o-rings (37.47 mm x 5.33 mm, 3 specimen per condition)
- Samples analyzed based on Norsok M-710a visual inspection method

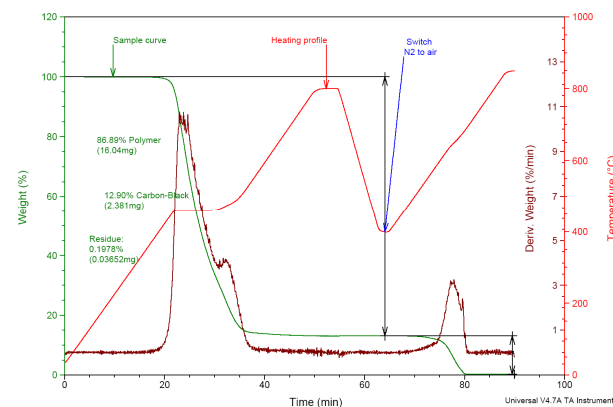
Analytical laboratory

THERMAL ANALYSIS

- Differential Scanning Calorimeter (D.S.C.)
- Thermo Gravimetric Analyzer (T.G.A.)
- Thermo Mechanical Analyzer (T.M.A.)



D.S.C

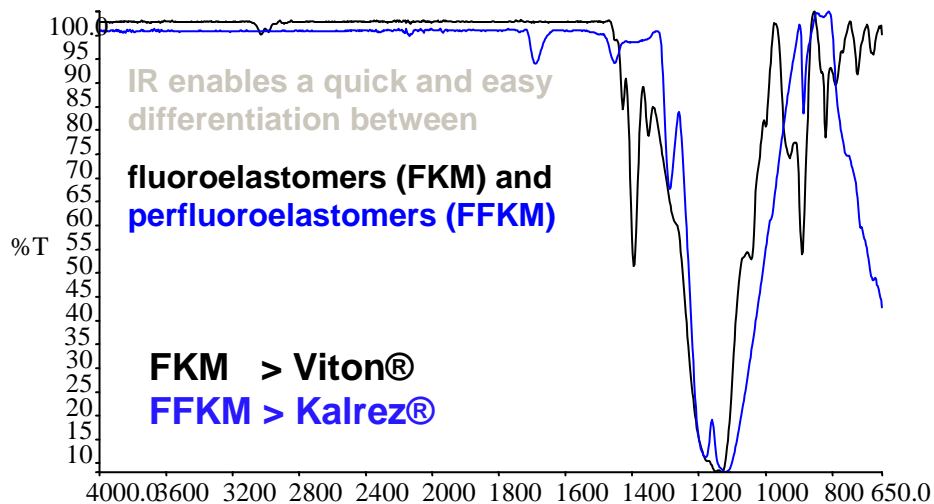


T.G.A

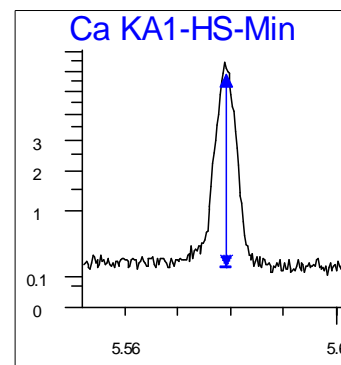
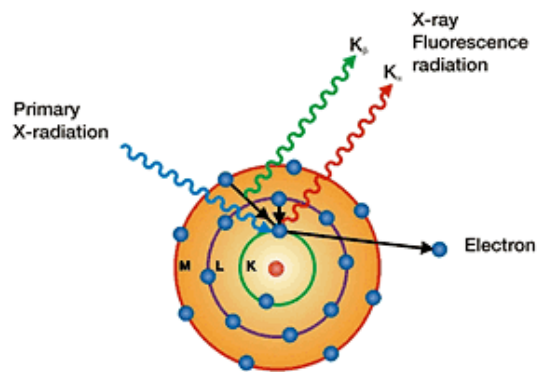
Analytical laboratory

□ SPECTROMETRIC ANALYSIS

□ Fourier Transformed Infra-Red Spectrometer (F.T.I.R.)



□ X-Ray Fluorescence Spectrometer (X.R.F.)



Analytical laboratory

- ❑ OPTICAL BINOCULAR & IMAGING
- ❑ ANALYTICAL FACILITIES FROM OTHER DUPONT DIVISIONS
- ❑ COMPLEMENTARY SUPPORT FROM RESEARCH INSTITUTE

Akron extrusion layout

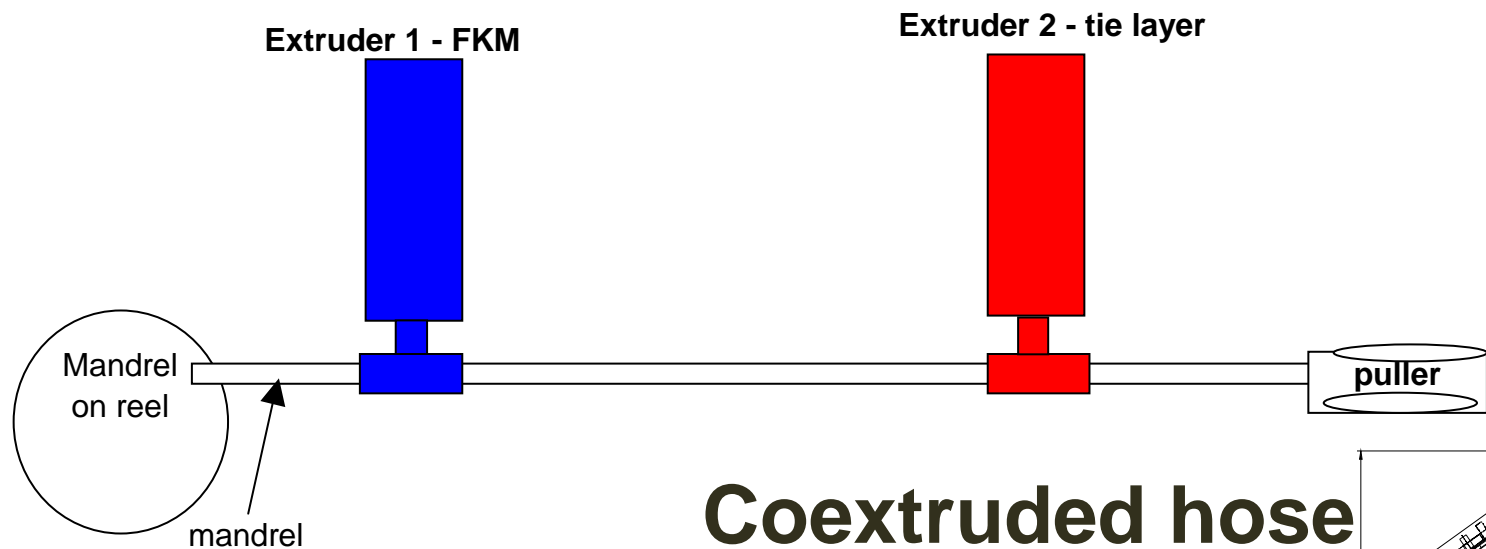


Barrier screw used for optimal FKM extrusion

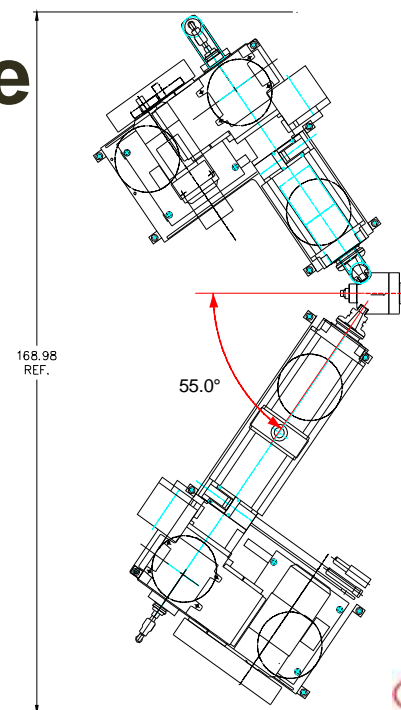
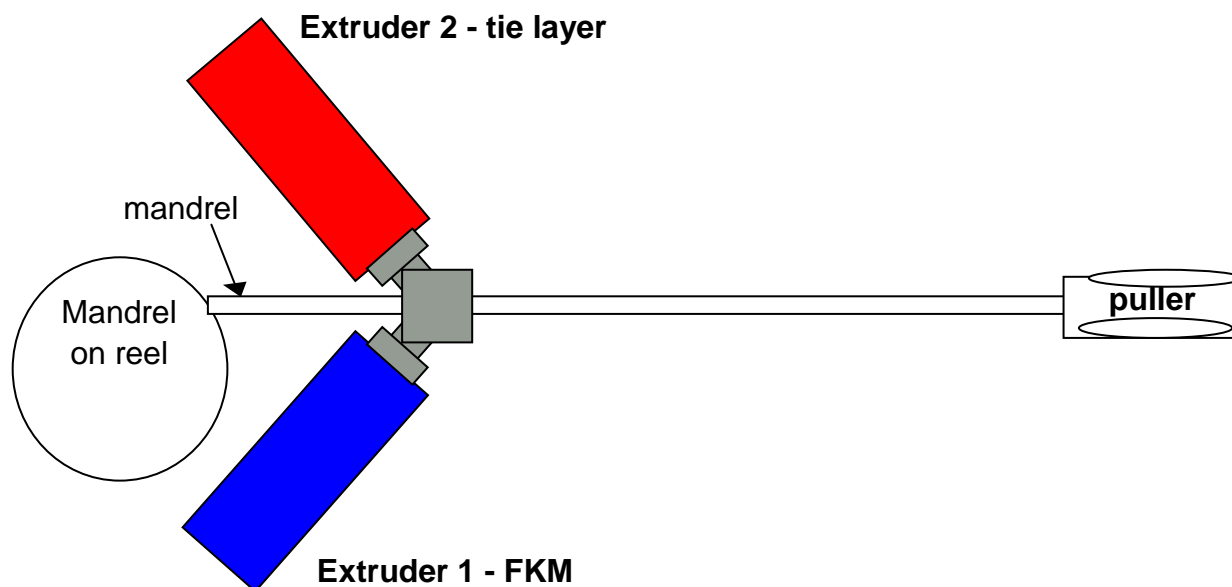
- Product / compound development
- VTR-7551 for thin veneers
- Bonding evaluation of Viton-silicone hoses for turbo charger & industrial applications

Akron multi-extrusion layout

Tandem Extruded hose



Coextruded hose



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