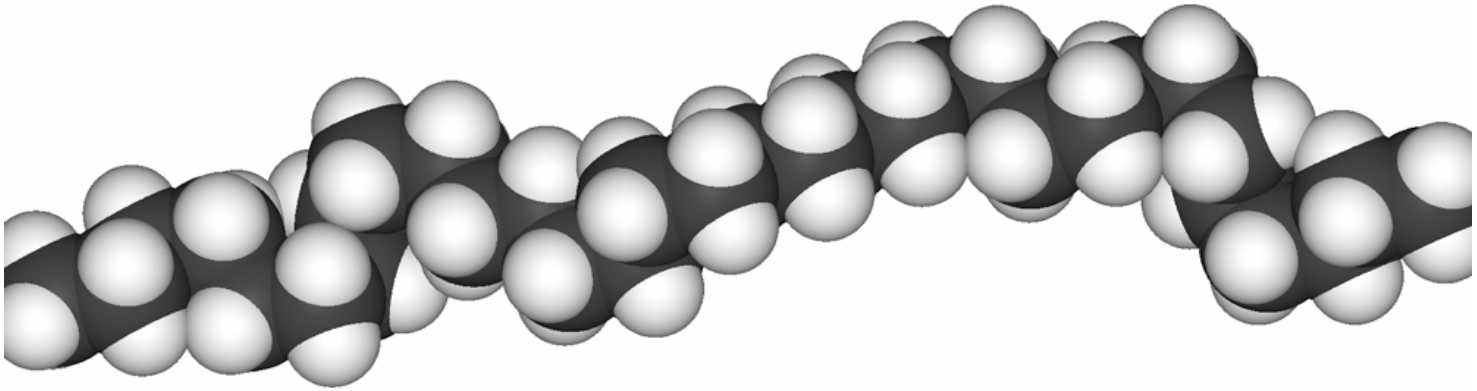
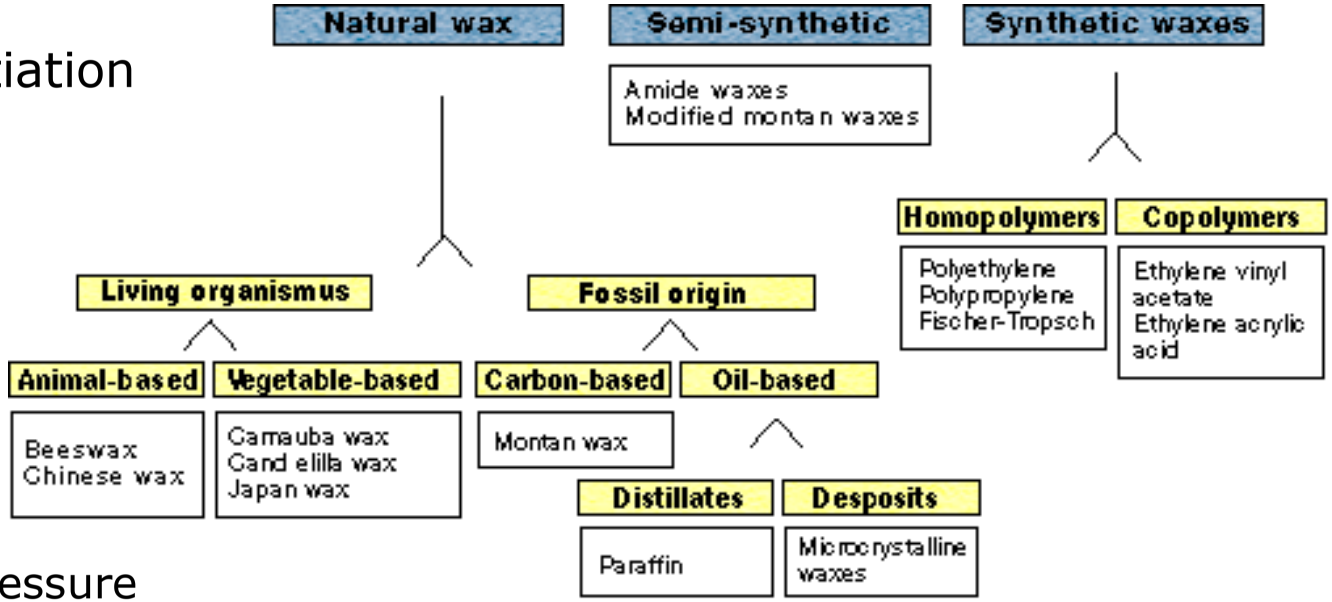
Polyethylene's & Sewability

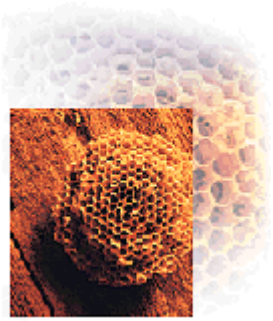


Polyethylene

- Chemical differentiation
- Sewability
- Handle
- Permanency

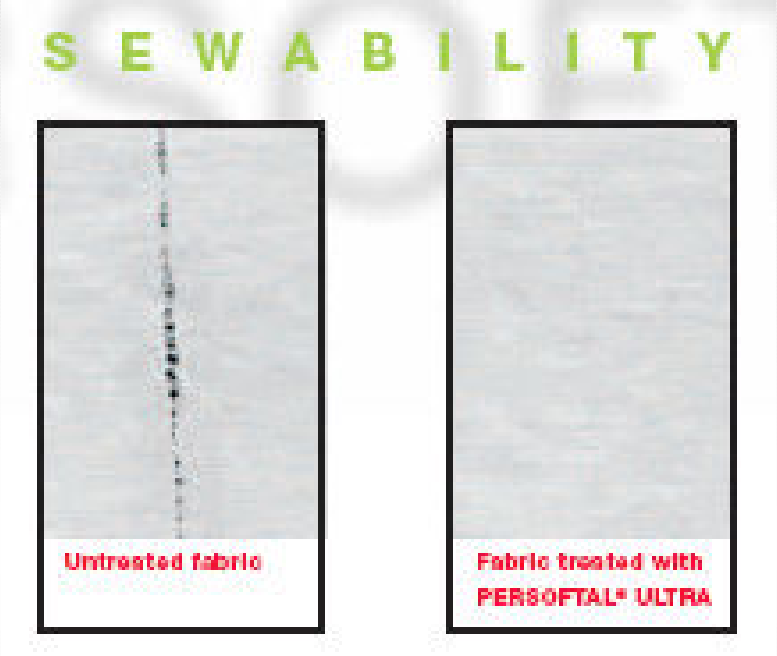


- Low density PE
  - Made at high pressure
  - Therefore more branched structure
- High density PE
  - Made with a catalyst
  - Therefore more crystalline structure



Static Sewability

- Static Sewability
  - This test enables to check the performance of a product on a few parameters like;
  - Lubrication and slipping
  - Preventing Cutting of fibers
  - Decreasing friction
    - of yarns/yarns
    - Of yarns / needle
- Needle standard
  - The needle standard is the amount of product required to ensure that no holes are produced during sewing with a specific needle



	Needle Standard		
Needle	**70Nm**	**75Nm**	**80Nm**
PERSOFTAL OE	0,5 %	1,5 %	2 %

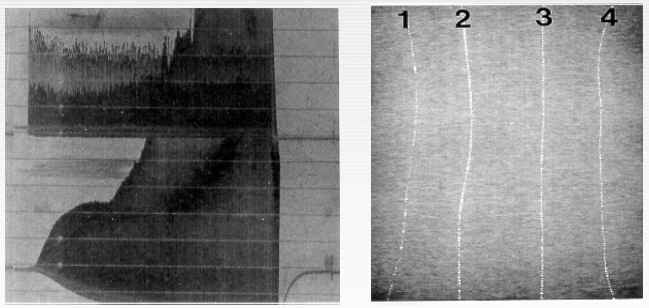
Dynamic sewability

- Dynamic sewability
  - During production of garments higher speeds and longer lengths are produced. Te static sewability test only shows a part of the picture and is therefore not complete.
  - The build up of temperature on the needle is one of the biggest concerns of confection factories. The heat of the needle can be that high that yarn breakages and production stops are caused.
  - The dynamic test is a test which is done on production scale using a temperature control unit in the Needle and a force measurement of the penetration of the needle
- Focus on longer runs and
  - Decreasing the friction
  - Decreasing temperature of the needle

Sewability

Needle penetration force **2200 cN**

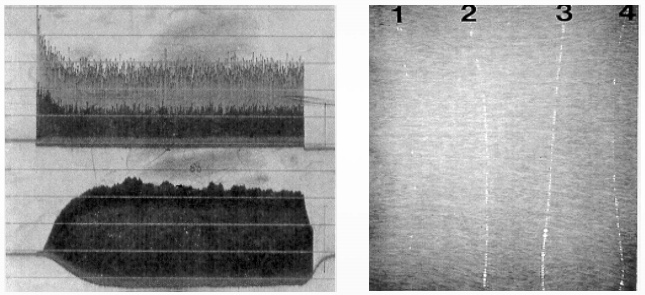
Needle temperature **> 400 °C**



Untreated cotton knitgoods

Needle penetration force **1550 cN**

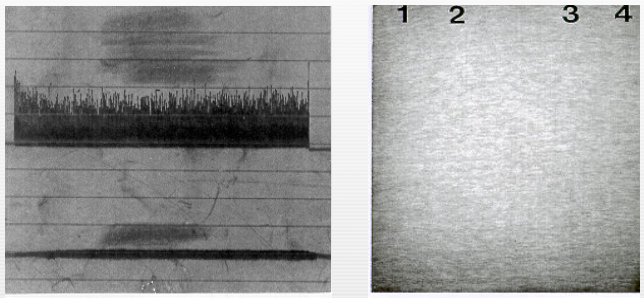
Needle temperature **288 °C**



Cationic softener

Needle penetration force **1000 cN**

Needle temperature **< 170 °C**



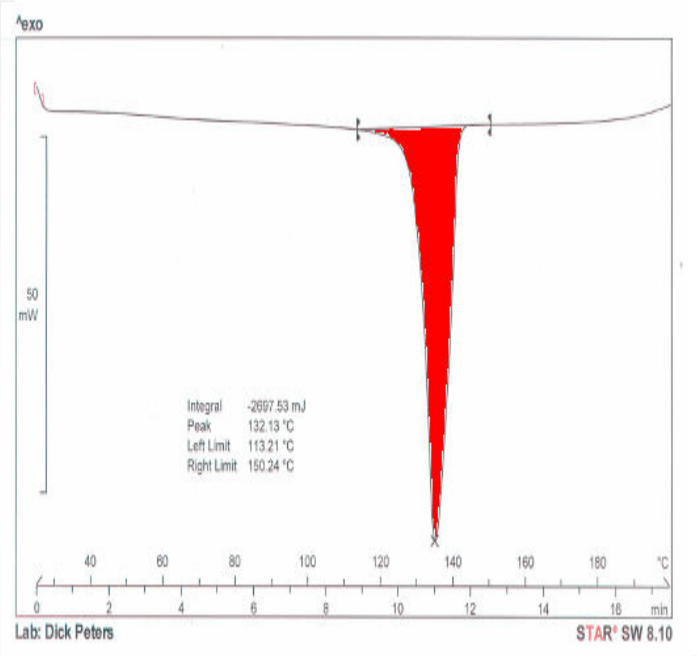
PERSOFTAL OE

New measurement

- The test mentioned before is however difficult to carry out and very costly
- We can easily measure the static sewability of a product
- There is a need of testing the temperature absorbance of the fabric.
- **Differential scanning calorimetry** or **DSC** is a thermoanalytical technique in which the difference in the amount of heat required to increase the temperature of a sample and reference are measured as a function of temperature.

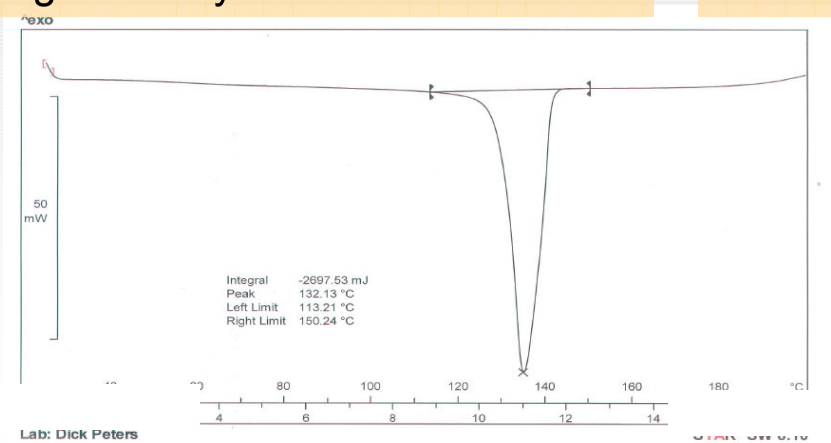
Surface = heatcapacity

- **Enthalpy** (symbolized *H*, also called **heat content**) is the sum of the internal energy of matter and the product of its volume and pressure.
  - Enthalpy is defined by the following equation:
  - where (all units given in SI)
  - *H* is the enthalpy
  - *U* is the internal energy, (joule)
  - *P* is the pressure of the system, (pascal)
  - *V* is the volume, (cubic metre)
- **The surfaces** indicates the amount of energy the product can absorb. This is a relevant indication of how th temperature of the needle can be removed.

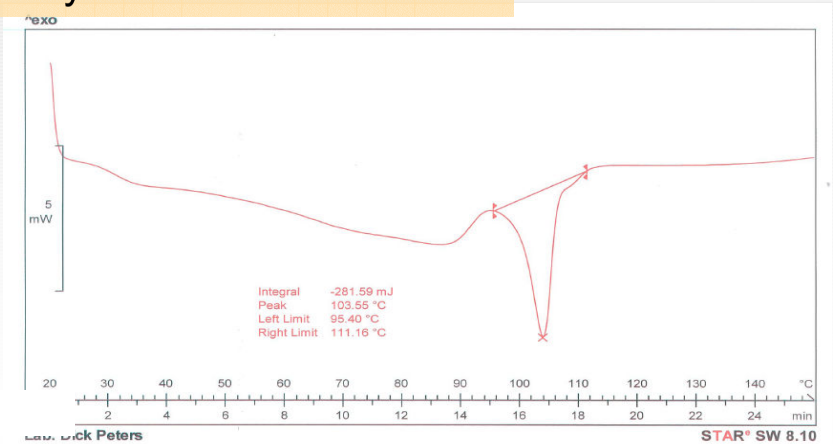


Differential Scanning Caloriemeter

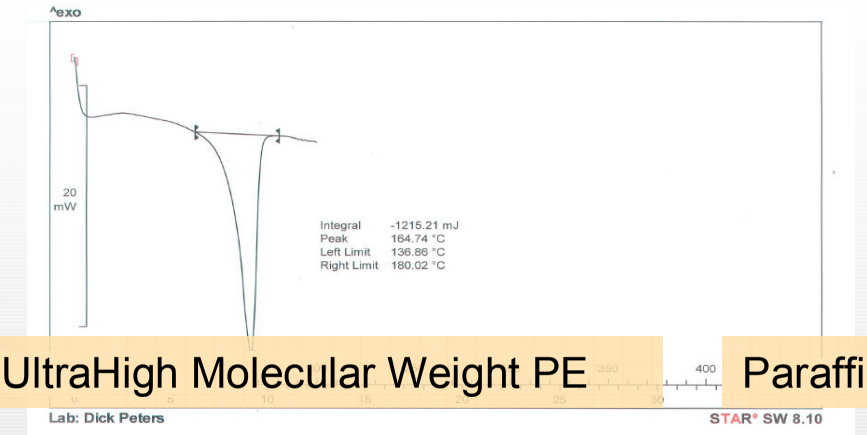
High Density PE



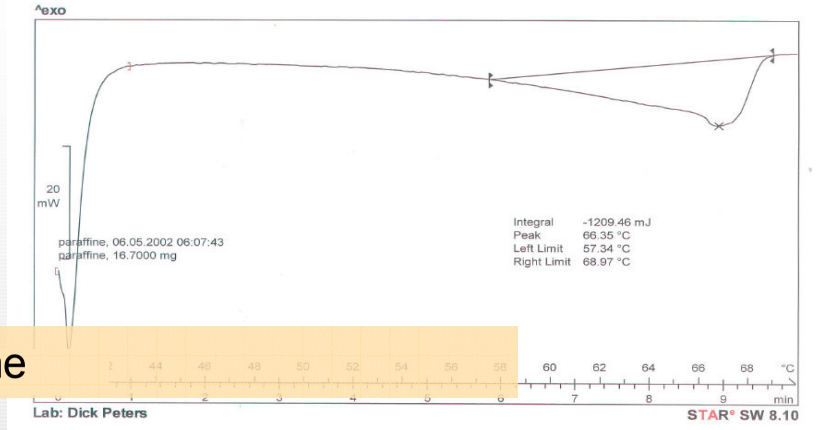
Low Density PE



UltraHigh Molecular Weight PE

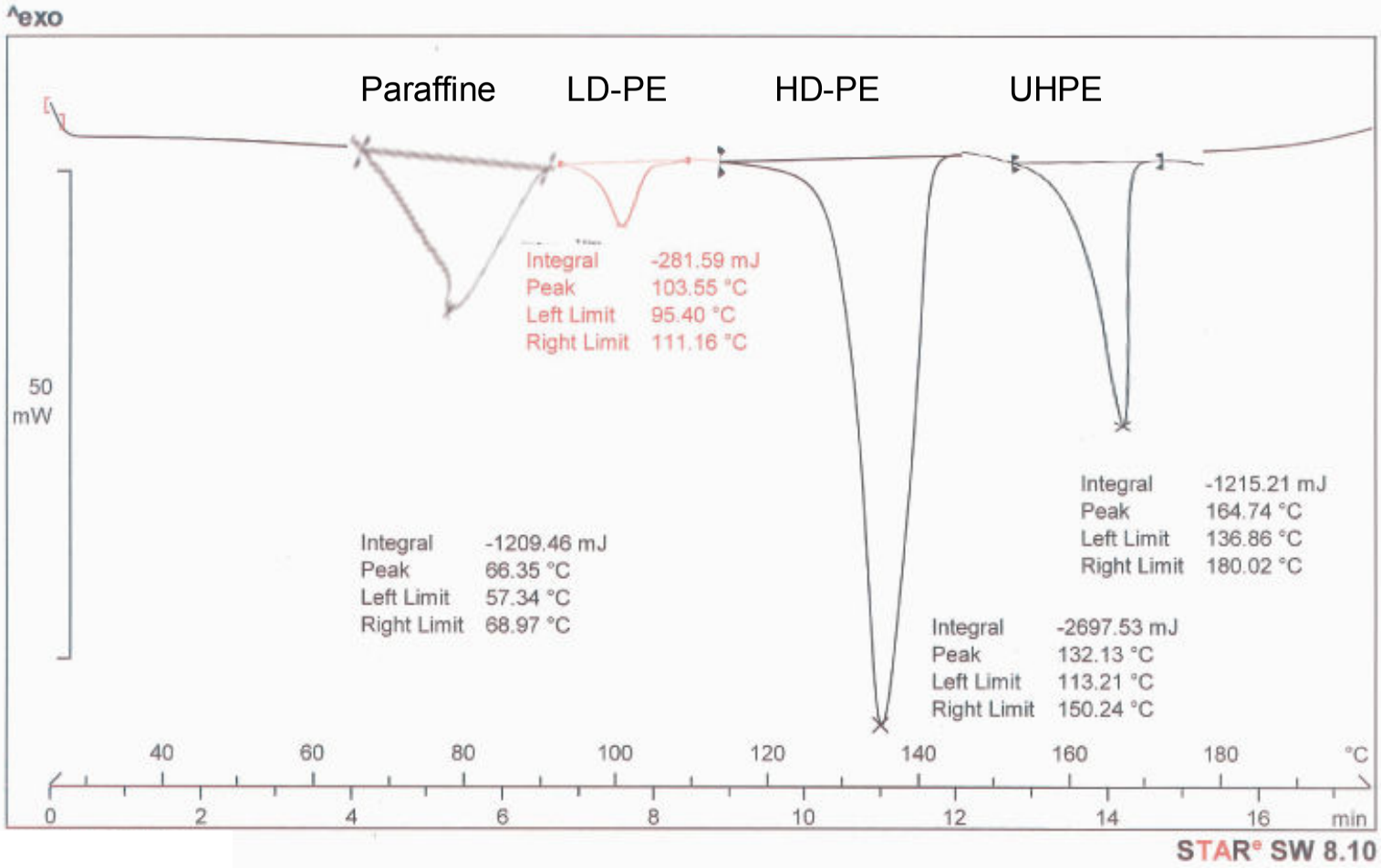


Paraffine

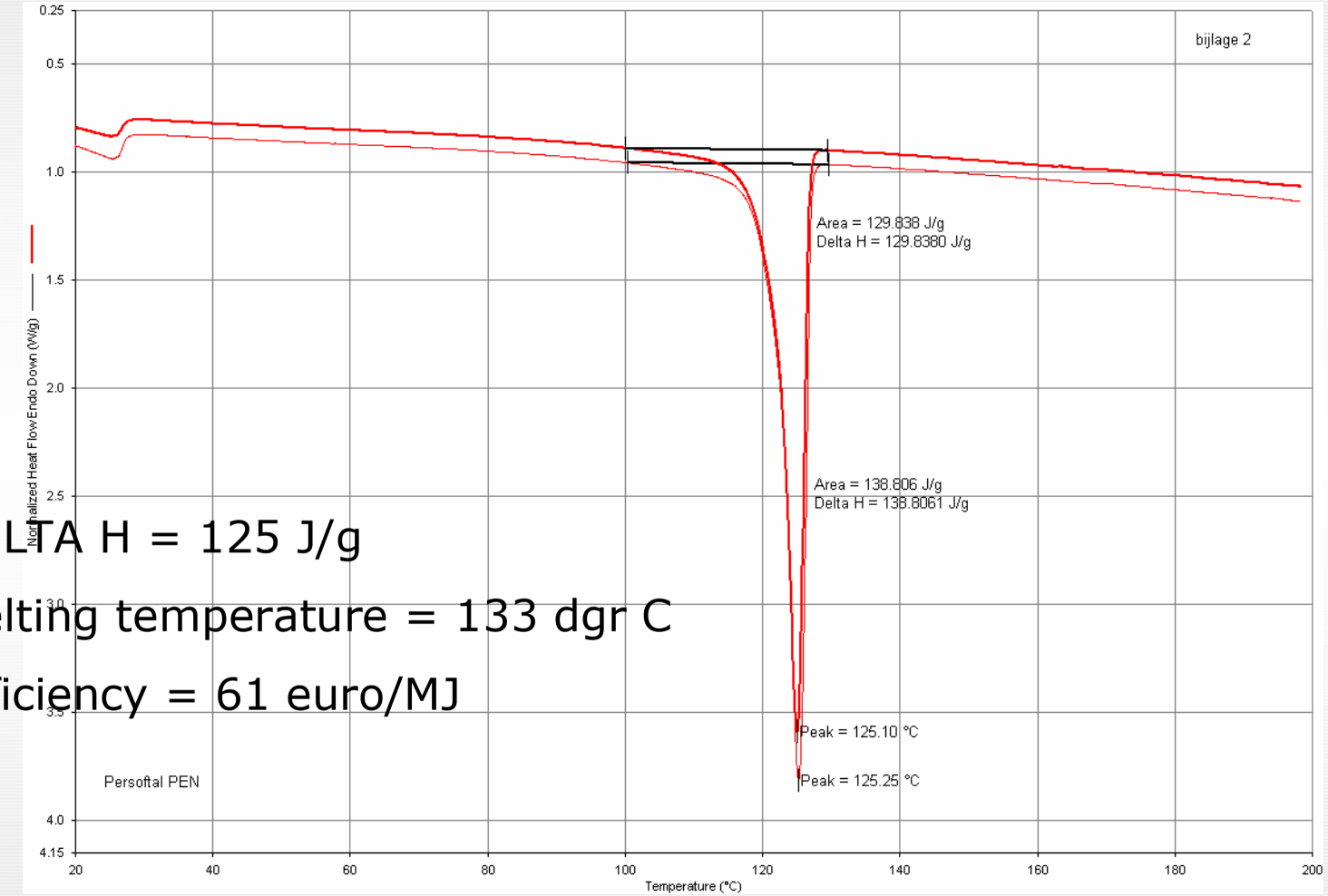


Polyethylene

HD-PE



PERSOFTAL PEN

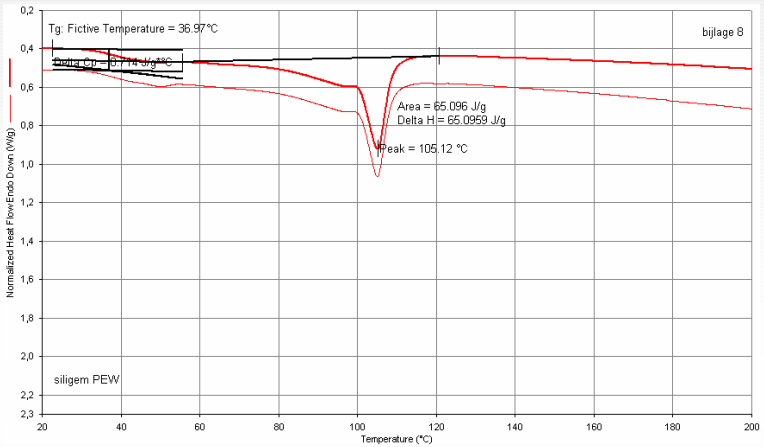


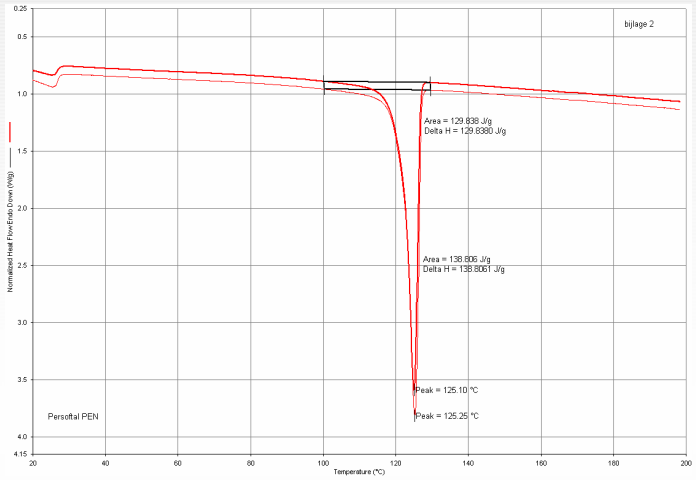
DELTA H = 125 J/g

Melting temperature = 133 dgr C

Efficiency = 61 euro/MJ

Competitor





DELTA H = 65 J/g

Melting temperature = 105 dgr C

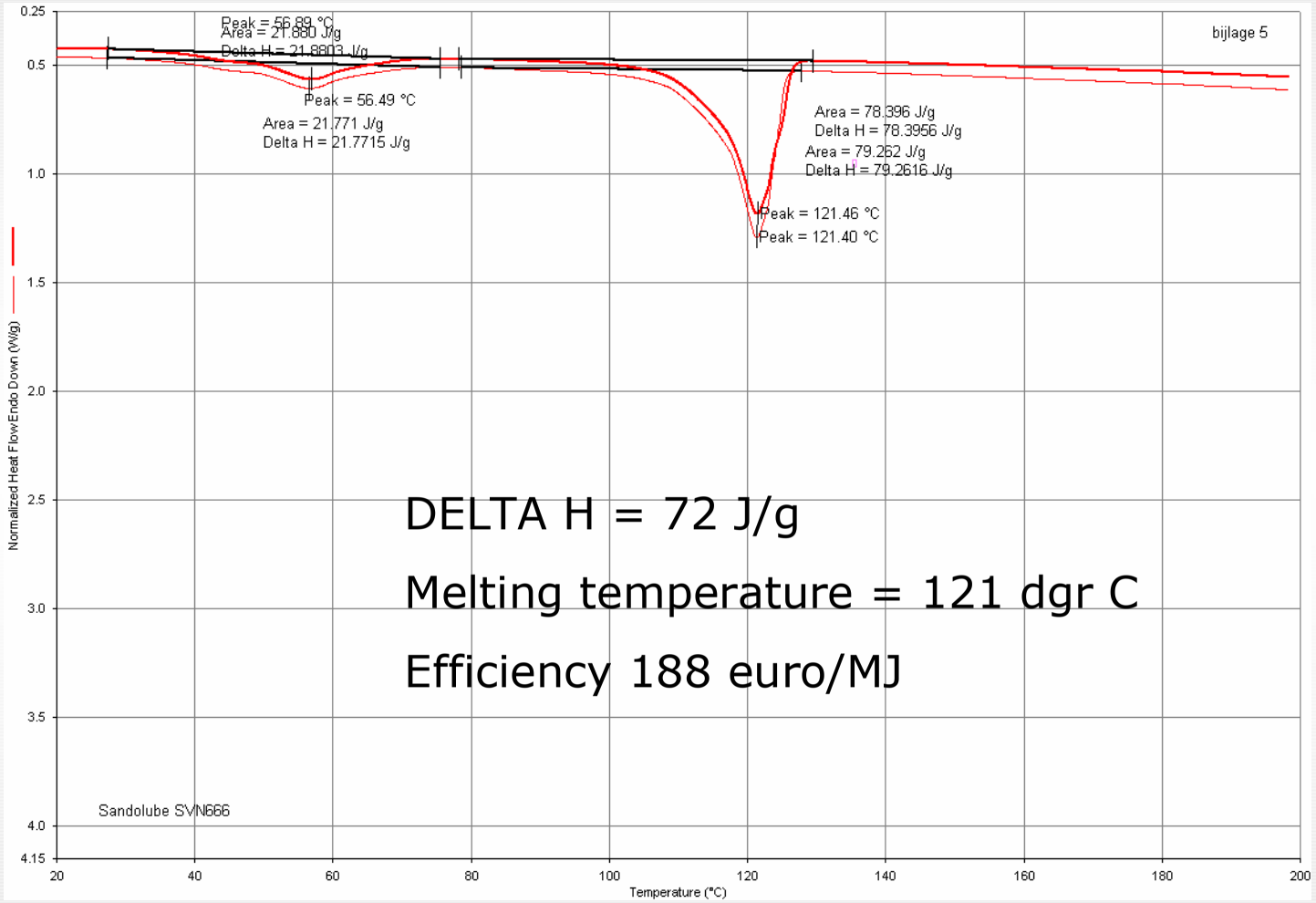
Efficiency 188 euro/MJ

DELTA H = 125 J/g

Melting temperature = 133 dgr C

Efficiency = 61 euro/MJ

Competitor B

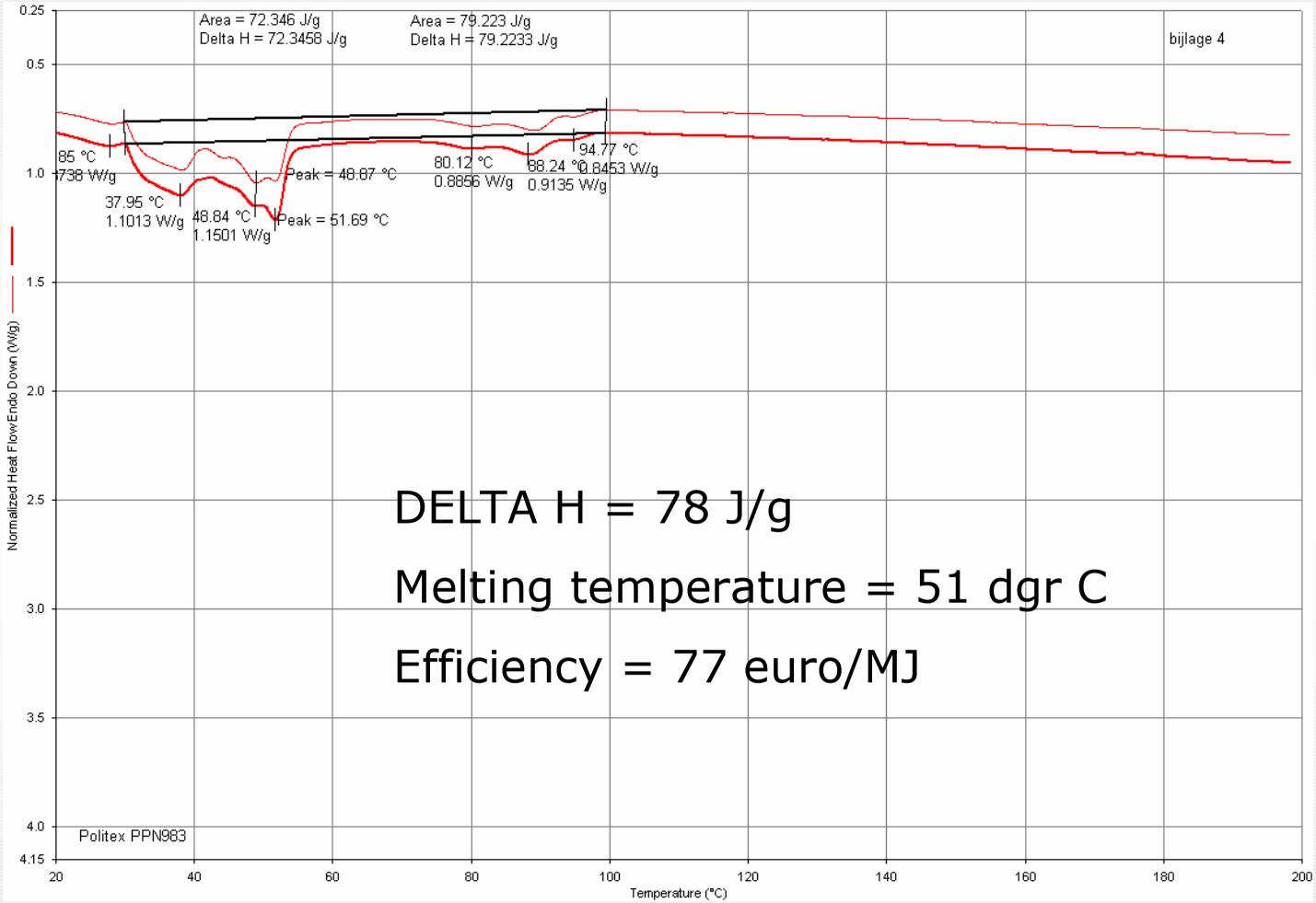


DELTA H = 72 J/g

Melting temperature = 121 dgr C

Efficiency 188 euro/MJ

Competitor C

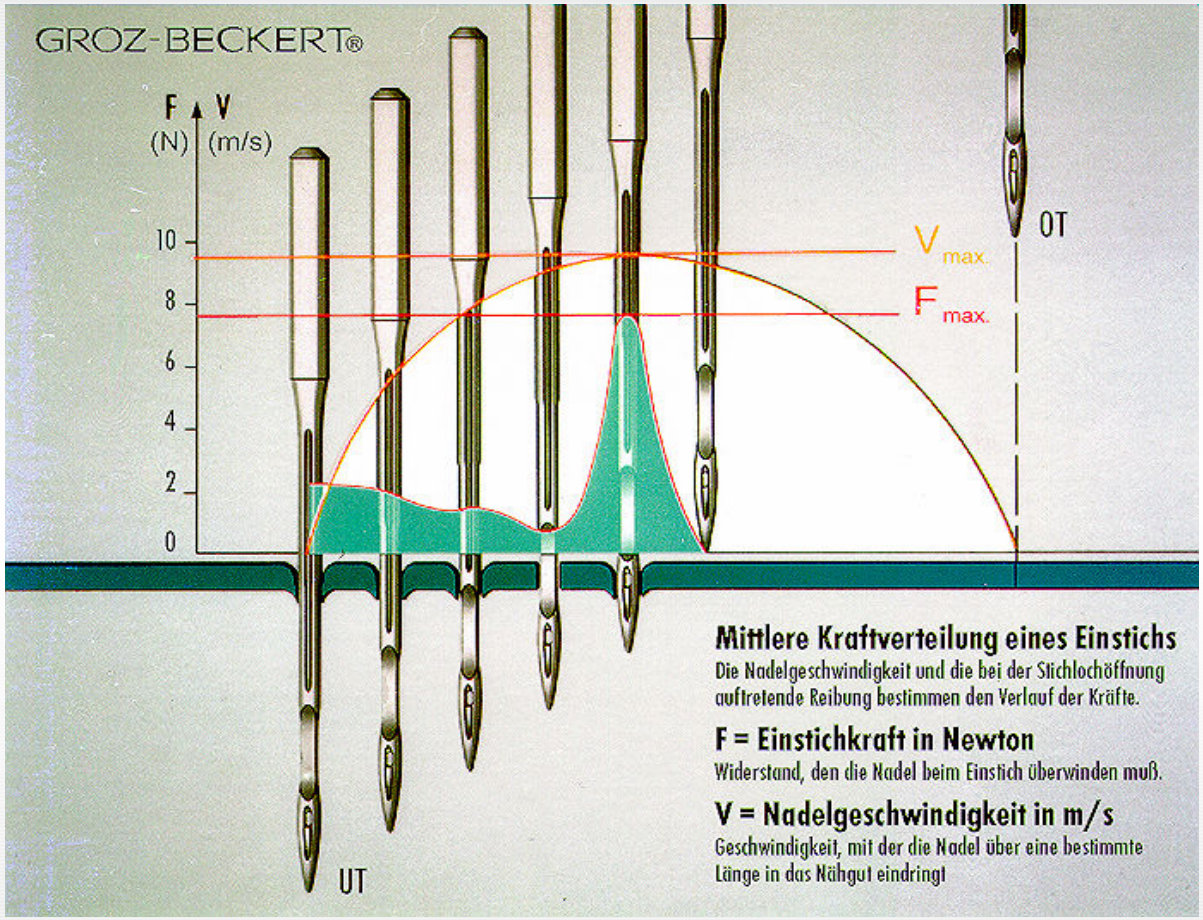


DELTA H = 78 J/g

Melting temperature = 51 dgr C

Efficiency = 77 euro/MJ

View of forces / friction.



$$F_w = \frac{v}{|v|}\mu_w F_n$$

v: relative speed between needle and fabric
F_w: penetration force
F_n: force
μ_w: friction coefficient.

The Penetration Force

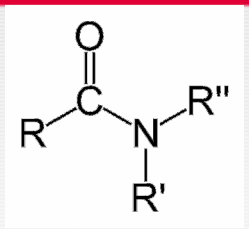
- The friction force is represented by the equation besides.
- Factors we can not change is
- the relative speed of the needle with the fabric v.
- nd the force Fn.
- μw
- The focus on the PERSOFTAL OE is on the friction coefficient μw. The mixtures of components is an equilibrium with the most optimum balance in handle and functionality.
- Fw
- The penetration force depends on the resistance of the needle experienced by the fabric. The PERSOFTAL OE increases the movability of the needle between the threads.

$$F_w = \frac{v}{|v|}\mu_w F_n$$

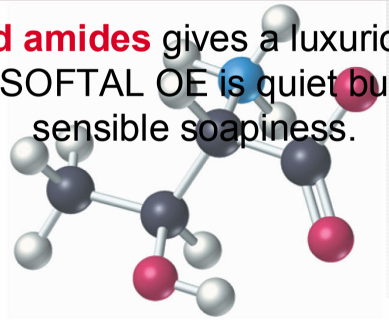
- PERSOFTAL OE lowers the penetration force due to its unique composition

PERSOFTAL OE

Handle

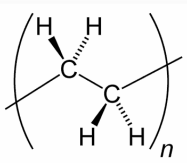


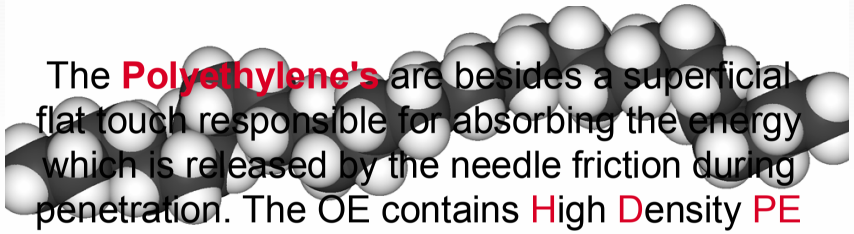
Fatty acid amides gives a luxurious touch. The PERSOFTAL OE is quiet bulky with a sensible soapiness.



Amide

Temperature absorption

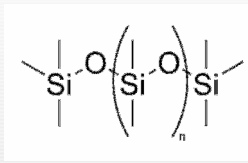


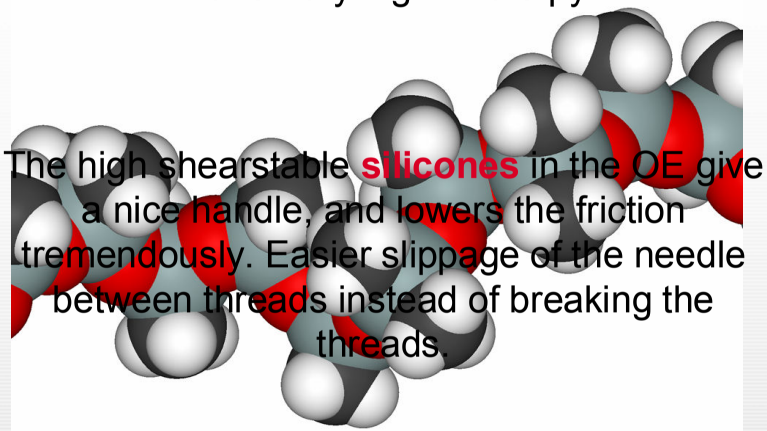


The **Polyethylene's** are besides a superficial flat touch responsible for absorbing the energy which is released by the needle friction during penetration. The OE contains High Density PE with a very high Enthalpy.

Polyethylene

Reduction friction





The high shearstable **silicones** in the OE give a nice handle, and lowers the friction tremendously. Easier slippage of the needle between threads instead of breaking the threads.

Silicone

Products with our HDPE

- PERSOFTAL PEN
  - Non-ionic HDPE
- PERSOFTAL PEK
  - Kationic HDPE, which is exhaustible
- PERSOFTAL OE
  - Compound product to improve handle and sewability
- PERSOTAL CNP
  - Wetwaxing agent
- PERSOFTAL PTK
  - Compound product for sewability improvement