SustainComp
1st OPEN CONFERENCE

Structure – Properties of wood fibre reinforced starch – based composites

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SEVENTH FRAMEWORK PROGRAMME

SustainComp

Presentation contents

- Novamont Profile and role in the Sustaincomp project
- Materials (Mater - Bi® wood Fibres)
- Mixing technology
- Material characterization
- Conclusions

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NOVAMONT PROFILE AS AN ENTERPRISE

- **PIONIER AND MARKET LEADER IN THE SECTOR OF BIODEGRADABLE MATERIALS FROM RENEWABLE RESOURCES**
- **TAILOR-MADE MATERIALS FOR A WIDE RANGE OF INDUSTRIAL APPLICATIONS (Mater-Bi trade-mark)**
- **STRONG PATENT PORTFOLIO >90patents (800 cases), >100MlEuro of investment, 10 awards,**
- **Awarded by EPO and EU as "Inventor of the year 2007" for the 1992 – 2001 patents on bioplastics and industrial achievements**
- **RESEARCH AND DEVELOPMENT AS THE DRIVING FORCE OF NOVAMONT'S INDUSTRIAL DEVELOPMENT (>6% of turnover , more than 25% of the human resources dedicated to research)**
- **SIGNIFICANT HISTORICAL GROWTH TREND OF REVENUES, WITH STEADY IMPROVEMENT IN OPERATING PERFORMANCE UP TO A TURNOVER OF 65 M€ IN 2009.**

Picture: Novamont's headquarters

NOVAMONT INVOLVMENT IN SUSTAINCOMP PROJECT

WP2	→	nanostructured composites foams
WP3	→	compounding and shaping of advanced composites
WP5	→	demonstration of sustainable product design (ecodesign). recyclability LCA and market

WP0 COORDINATION

TARGET

Realization of a composite (pellets and foamed sheets) with new and useful properties for the defined (in cooperation with WP5) application sector

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INDUSTRIAL APPLICATIONS OF MATER-BI®

Mater - Bi® starch based grades for Injection Moulding applications

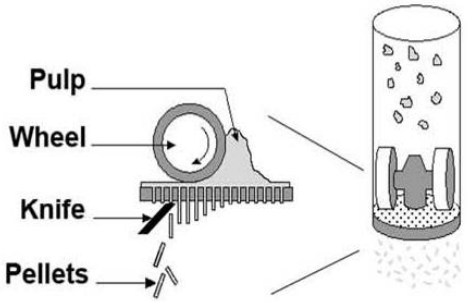
Characteristics

- ✓ good dimensional stability
- ✓ productivity comparable to traditional plastics (in terms of cycle/ minutes, etc)
- ✓ possibility to use moulds designed for traditional materials
- ✓ possibility to colour in bulk using biodegradable Master-batches

Pelletized cellulose fibres

Cellulose fibre pellets:

- Raw material: fluffed sulphite fiber
- Pellets production at 45 % dry content
- Various size of the pellets
- Dry at room temp for several days until 95-97 % dry content.
- Density 202Kg/m3
- Average fiber length
  - –Before pelletisation: 1.390 mm
  - –After pelletisation: 0.950 mm
  - –L/d ≈ 40



The Kahl pellets press and pellets production principle

D. Turati-Novamont S.p.A.

NOVAMONT TARGET IN SUSTAINCOMP PROJECT (WP3)

- to define a Mater Bi matrix suitable to be compounded with fibres (injection moulding applications)

- to realize a composite with increased properties (mechanical, thermal...)

- to define a demonstrator where the compostability is a benefit for waste management (according to LCA analysis, WP5)

Pellets for injection moulding **applications suitable for catering moulded parts (e.g. fork, plats...)**

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Material characterization

- Rheological analysis (*viscosity under shear stress*)
- Scanning Electron Microscopy (*fibres distribution*)
- Injection Moulding Test (*mouldability*)
- Mechanical properties (*stress strain curves – Impact tests*)
- Thermal properties (*Heat Distortion Temperature*)
- Biodegradation Test (*disintegration test*)

Rheological analysis

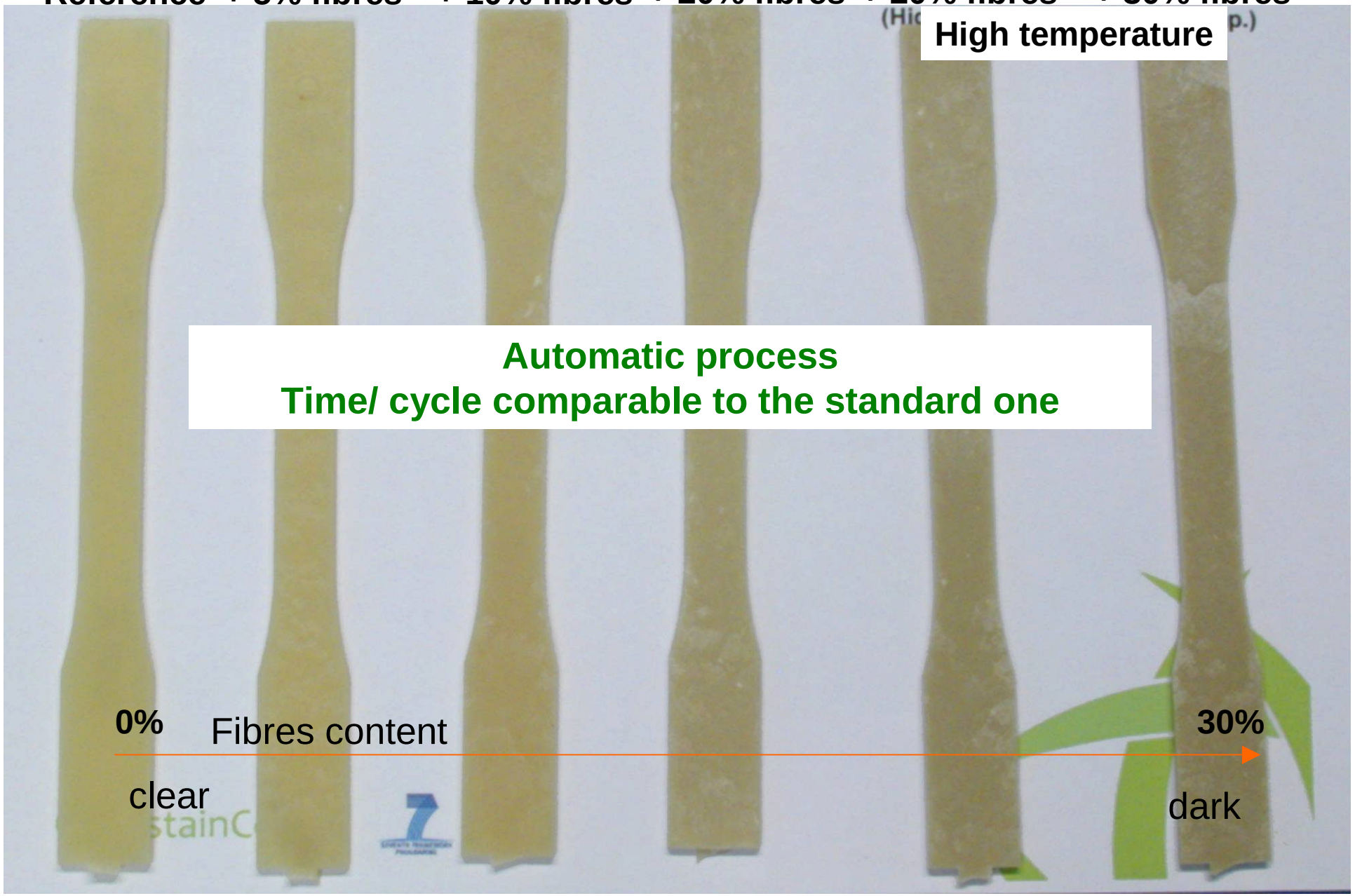
- When we increase the percentage of fibres, melt viscosity increases
- No effect of the increasing in process temperature
- Viscosity of matrix B is higher compared to the Matrix A

Scanning Electron Microscopy - Matrix A

Good dispersion and distribution

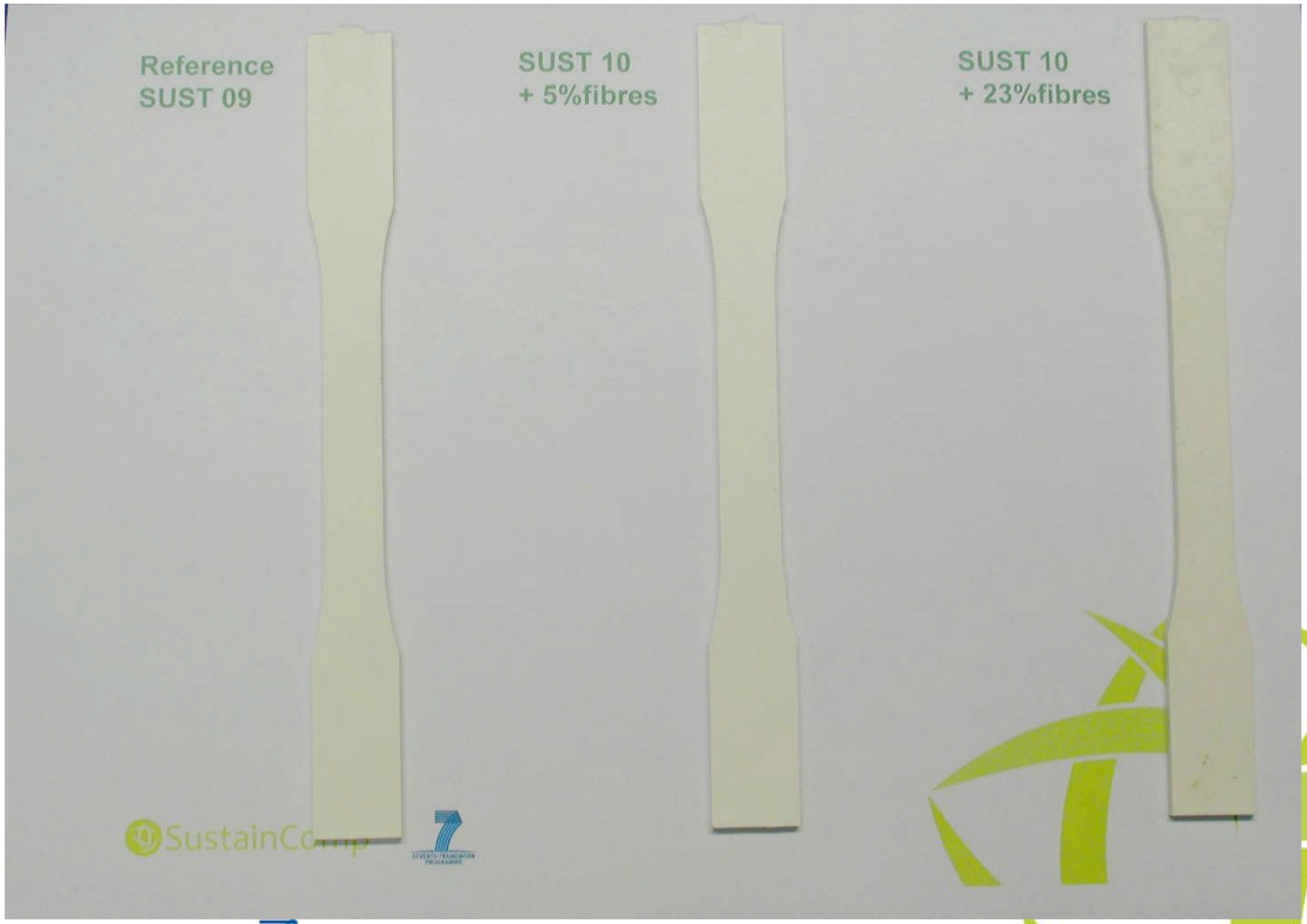
Injection Moulding Test – “Matrix A”

Reference + 5% fibres + 10% fibres + 20% fibres + 20% fibres + 30% fibres



Injection Moulding Test – “Matrix B”

- Automatic process
- Time/ cycle comparable to the standard one
- Dumbbells with this formulation have lighter color



Mechanical Properties- comparison two matrices (tensile stress - strain)

- Joung's Modulus is higher, Matrix B needs lower fibres to reach the same properties of "Matrix A".
- With 20% of fibres we increase the Joung's modulus of 300%

Impact tests – Matrix A

- the presence of fibres is a sort of defect in the material for both tests
- An increase in Heat Distortion Temperature is present using 30% of fibres.

Biodegradation Test – Matrix A

All the products pass the tests

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Conclusions

The pelletized cellulose fibres have:

Good processability (up to 20%)

The Mater - Bi® matrices have, compounded with fibres:

Good processability
Good disintegradability
Good mechanical properties
Higher viscosity
Different color

The Mater - Bi® matrices have:

Different viscosity
Same (mechanical) properties with different level of fibres

- Both Mater Bi® grades are suitable to be compounded with fibres
- The properties obtained are in line with the expectation for a new (composite) material for catering applications

Thanks for the attention!!!

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