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NANO-ENGINEER YOUR FUTURE™



THE CARBON NANOTUBE SPECIALIST

www.nanocyl.com



Oser le Japon ?
Nanocyl – Case Study
June 10th, 2011

Nanocyl at a Glance



Funded in 2002, privately owned

Headquarters in Sambreville, Belgium - **Legal entities** in the USA and South Korea

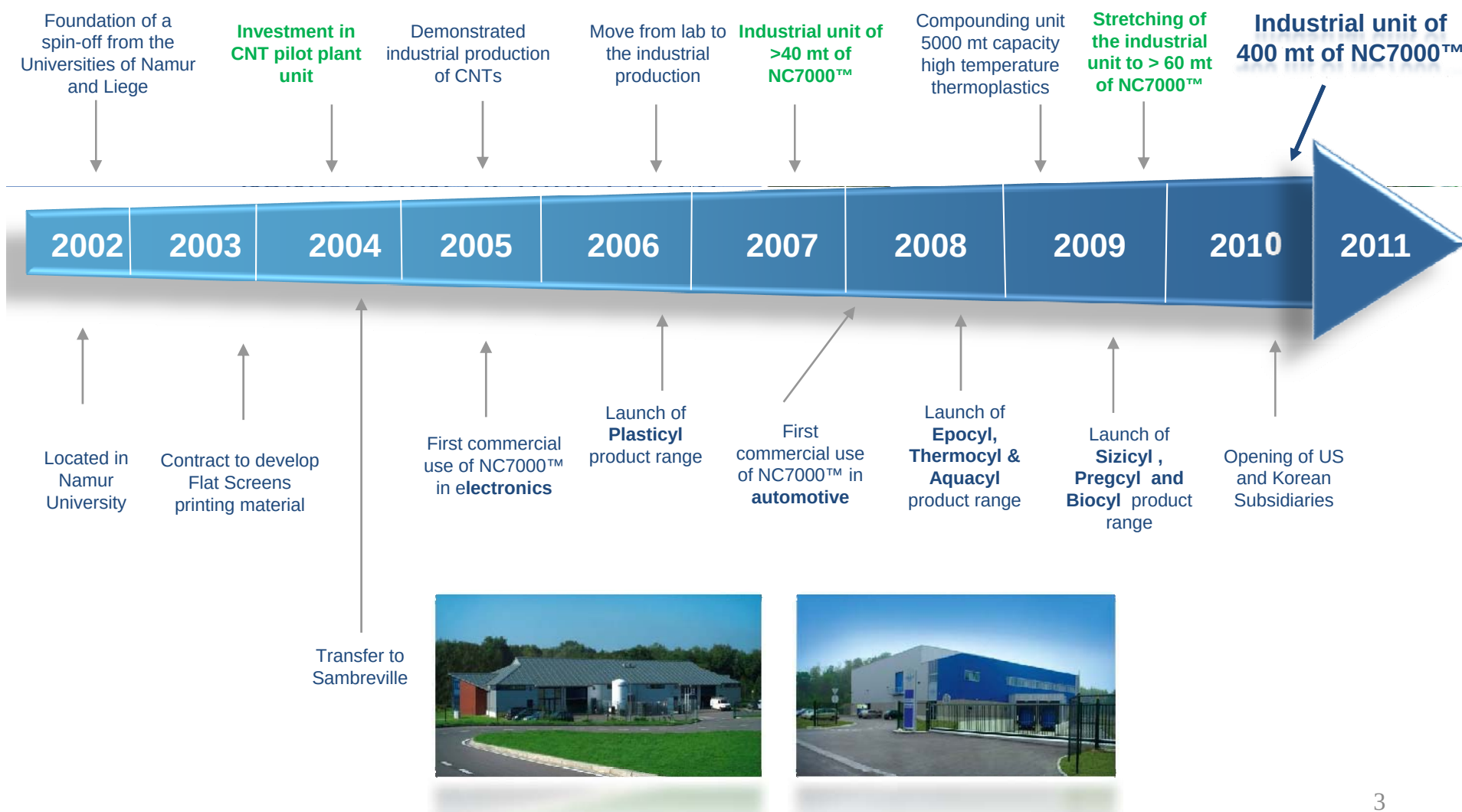
Global Organisation:

- Collaborations globally with more than 20 universities or public research labs
- Distributors in Europe, Americas and Asia Pacific regions

Member of CEFIC and PACTE (Producer Association of Carbon Nanotubes in Europe)

Registrations: REACH, TSCA

History & Milestones



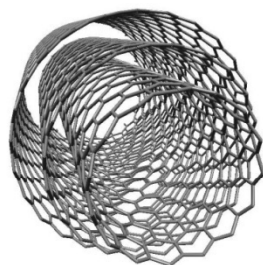
What are Carbon Nanotubes (CNT's) ?

Carbon nanotubes are a physical form of carbon with superior properties

- Carbon is a chemical element that exists in different physical forms (allotropes), each with its specific properties. The best known examples of carbon allotropes are **diamonds** (known for their hardness and light dispersion) and **graphite**.
- **Carbon nanotube (CNT)** is another physical form of carbon, that combines the above extraordinary properties and shows amongst others superior strength, superior electrical and thermal conductivity.

Structure

- Carbon nanotubes are **cylindrical carbon molecules**. Their name is derived from their diameter size, which is on the order of a few nanometers (approximately 10,000 times smaller than the width of a human hair), while they can be up to a few millimetres in length.



Application

- To the human eye, carbon nanotubes appear as a **black powder**.
- These carbon nanotubes are **used as additive** into various matrices such as polymers (plastics), epoxy resins, water, textile, metals, etc. The addition of CNTs **enhances the base materials' unique properties** while adding new properties to these materials.



CNT Specific Properties

Carbon nanotubes exhibit **unique properties** on 4 major levels and many more:



Electrical Conductivity

The electrical conductivity of CNTs is much higher than copper, allowing non-conductive plastics to be turned into conductive materials.



Mechanical Strength

Thanks to their high elasticity and excellent tensile strength, carbon nanotubes exhibit a mechanical strength which is 5 times higher than steel – at only a quarter of the specific weight.



Thermal Conductivity

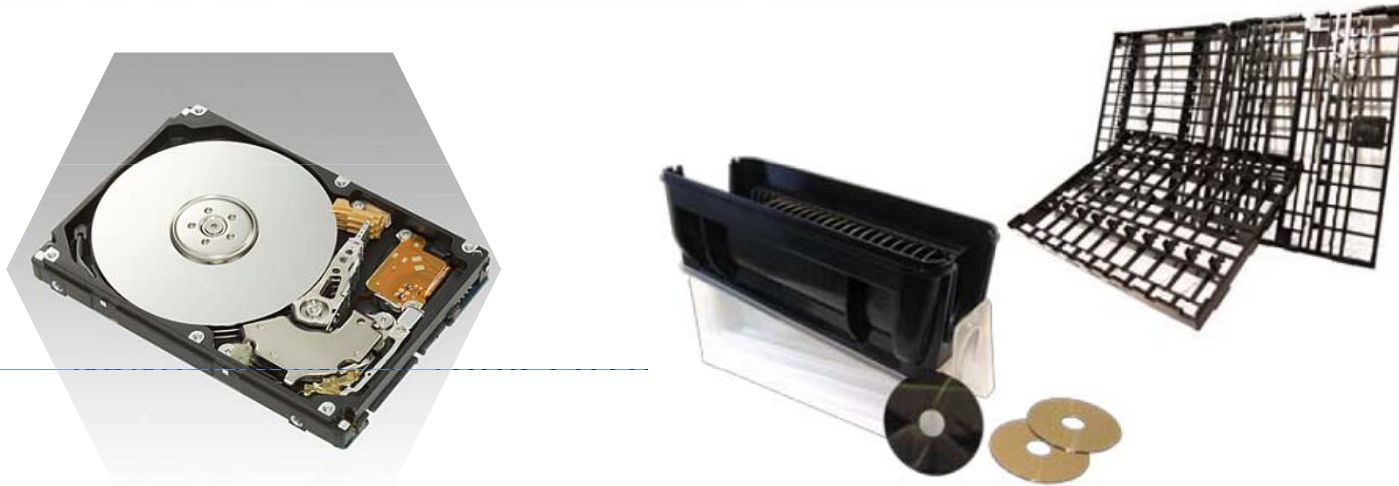
CNTs beat the thermal conductivity of the best natural thermal conductor of all – diamonds.



Flame Retardancy

Carbon nanotubes have the ability to promote flame retardancy at very low filling levels thanks to the formation of a thermal insulating and low permeable char.

Commercial Applications of Nanocyl NC7000™



IC trays and HDD components handling trays

- Higher Cleanliness : less outgassing and low particle count
→ decreased risk of contamination
- More homogeneous parts
→ elimination of residual voltage
- Better dimensional stability and recyclability

Flow of fuel creates static charges which can lead to arc piercing a hole into fuel-system components, resulting in escape of fuel and vapors

Conductive Fuel Pump Housing

- Meets SAE J1645 standards
- Weight reduction of automotive parts
- Design freedom, due to easier processing of Nanocyl compounds
- Dimensional stability & creep resistance
- Electrical conductivity at low loading
- Fits existing machinery/tools



Rubber & Elastomers Applications

Addition of CNT to thermoset elastomers (NR, IR, SBR, NBR, HNBR, FKM, EPDM, IIR...) improves:

- Heat resistance
- Abrasion and tear resistance
- Energy to fracture
- Modulus



Longer life for rubber hoses



Better abrasion resistance
Timing & conveyor belts

Higher operating temperature
Drilling equipment

Patented Technology

With ThermoCyl™, Nanocyl owns a **patented technology** exhibiting exceptional fire resistance by incorporation of specifically designed carbon nanotubes in a RTV silicone matrix.

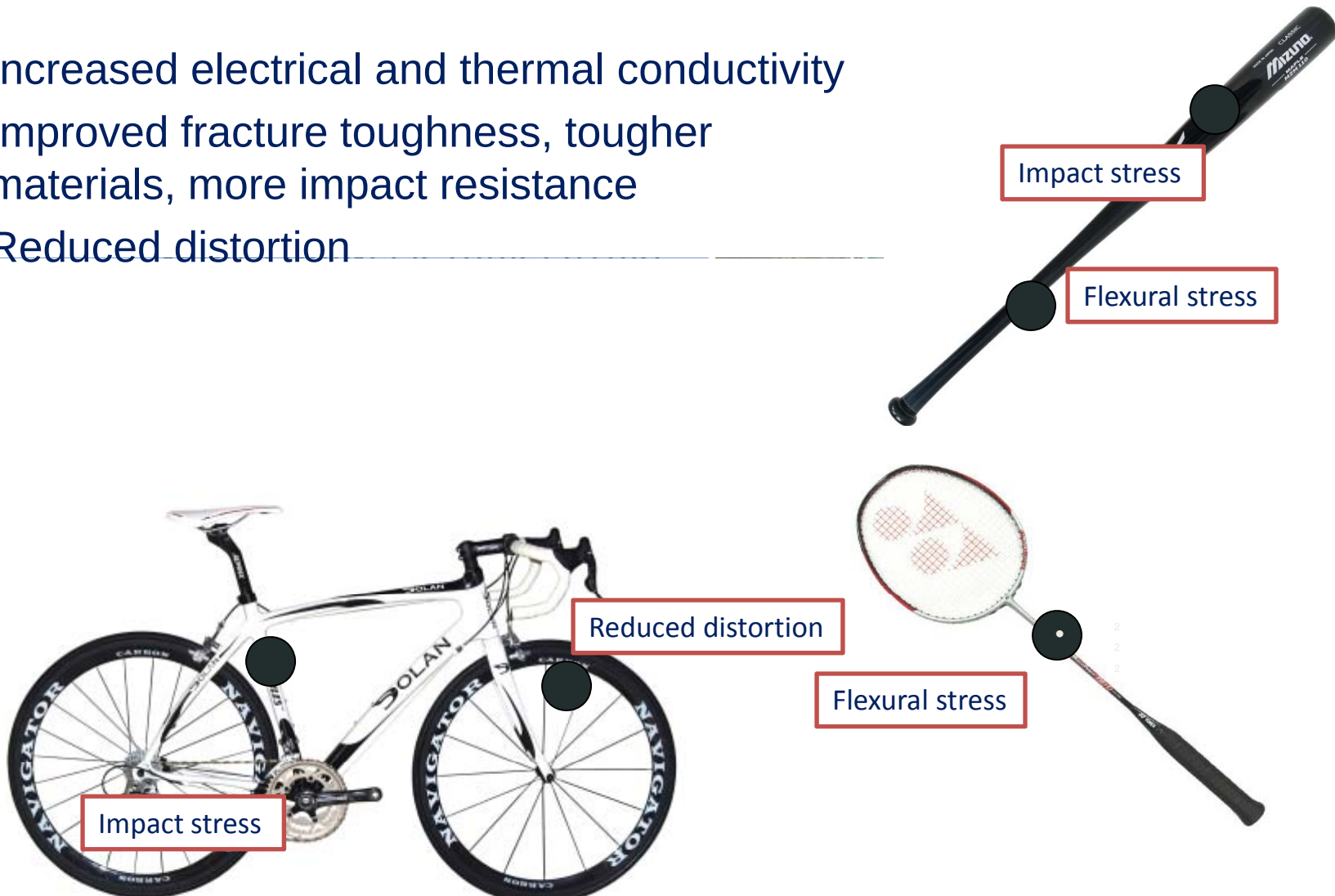
Flame Retardant (FR) coating protecting a wide variety of different substrates.

- Metal protection
- Wire & Cable
- Open cell foams
- Textiles



Structural Composites Applications

- Increased electrical and thermal conductivity
- Improved fracture toughness, tougher materials, more impact resistance
- Reduced distortion



Nanocyl in Japan

- **The Asian Pacific Region is today the largest consumer of Carbon Nanotubes**
- **50 % of the sales revenue of Nanocyl come from our sales to the Asia Pacific region**
- **Nanocyl has an office in Japan with two Japanese representatives**
- **The first cooperation agreement that Nanocyl has had with an industrial firm was with a Japanese company**
- **Nanocyl is today selling its carbon nanotubes in Japan in all its key market segments : electronic packaging, automotive, elastomers and sporting goods**

■ Challenges:

- The Japanese customers are the most demanding ones in term of quality and services
- The Japanese customers do prefer Japanese suppliers even if they are more expensive or offering less performing products

■ Opportunities:

- The Japanese market is an opportunity if you can offer the best quality and a high level of service, which is the case of Nanocyl
- If the technology is validated by Japanese customers, this means that you can sell everywhere in the world
- Japanese customers are willing to pay for value and service

- **The BJA association, thanks to its Yes Program is helping Nanocyl young managers to get introduced to the Japanese industry and to learn how to be successful with Japanese customers**

- **The AWEX is supporting Nanocyl for its participation at “Nanotech Japan”, the best exhibition on nanotechnology**

Carbon Nanotubes is the most advanced nanotechnology and one of the most promising technology of the third millennium

Nanocyl is establishing itself as the world leader in carbon nanotube technology thanks to our best performing nanotubes and our high level of service

Despite the distance and the cultural differences, the value proposition of Nanocyl is fitting very well with the Japanese requirements

The BJA and the AWEX are very helpful for a small company such as Nanocyl for the different services and supports they are offering



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