The TEKNOBLADE REPAIR 9000 – a practical approach to Leading Edge Protection for wind turbine blades

Agenda

- Short presentation of Teknos
- Essences of the market survey
- Course and effect of rain erosion
- The challenge
- The solution
- Other Teknos products for Blades
- Question and discussion

Teknos in brief

100,000

tons of paint a year

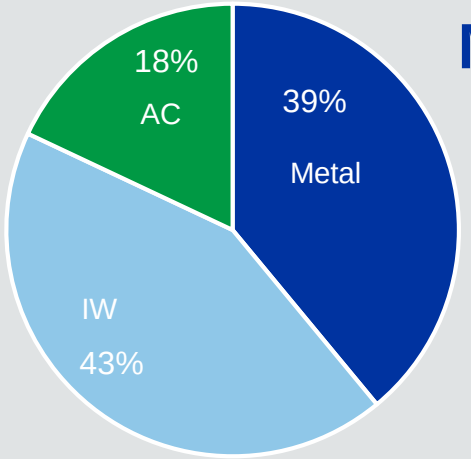
1,700

employees
of which over 250 in R&D

Net sales in 2018

408

MEUR



One of Finland's biggest

family-owned businesses

Global-Local

global network, local service

20+ countries

In Europe, Asia and Northern America

+ a global reach through an extensive dealer network

11

production countries

Finland
Denmark
Sweden
Poland
Germany
Russia
China
The Netherlands
Malaysia
Liechtenstein
The USA

Glob-Loc is in our DNA

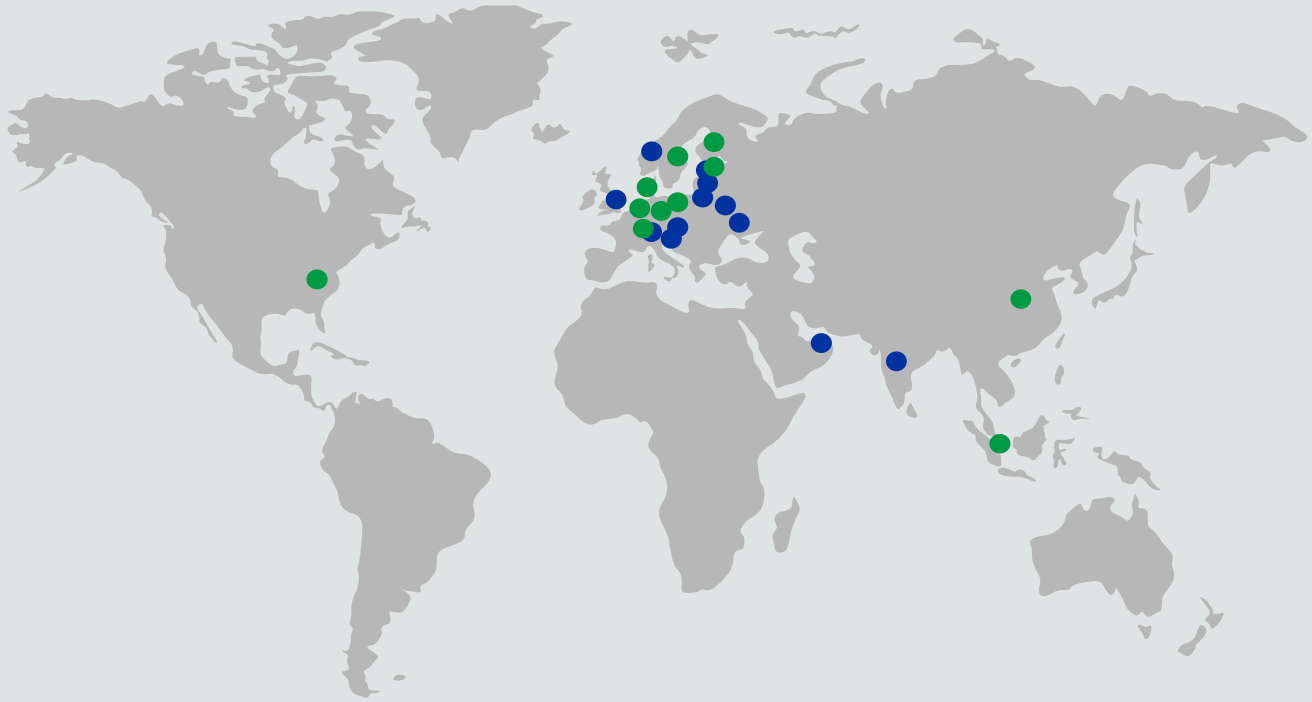
Our Glob-Loc strategy means an ambitious global expansion with focus on local service towards customers.

Local

- Service in local language
- Agile technical support
- Customized trainings, inspections and other localservices, ie. tinting
- Local production in many countries

Global

- Global product portfolio
- Strong focus on product development and quality management
- Benchmarking of our markets for new innovations
- Sharing of our know-how



- Teknos production sites
- Teknos own sales points

Our local competence

- Finland (HQ)
- Arabemirates
- China
- Croatia
- Czech
- Denmark
- Estonia
- Germany
- India
- Ireland
- Latvia
- Liechtenstein
- Lithuania
- Malaysia
- Norway
- Poland
- Russia
- Slovenia
- Sweden
- Switzerland
- The Netherlands
- UK
- Ukraine
- USA

Essences of the market survey

Teknos conducted a market survey on several companies that provided repair work for wind turbine blades.

The majority of the respondents, expressed that the following properties were of the highest importance:

- One product solution (filler and LEP in one product)
- Easy to apply, also when accessing the blade by rope
- Fast cure solution to minimizes down time
- Long service life
- Easy on site quality control of applied coating (Shore A for curing control)
- Safe to use, with a minimum of personal protection (PPE)

Course and effect of rain erosion

- Rain, hail, ice, UV-light, water absorption and other climatic conditions may erode the leading edge on wind turbine blades

- Risk of reduced yield, structural damage and economical loss from downtime

The challenge

- Currently 75.000 blades globally reported in need for remedial attention
- This number is day by day increasing, because of slow repair procedures and few possible working days, especially for offshore sites
- The length of damaged LEP is normally 10-15 meters, but with increasing length of the blades this area will grow

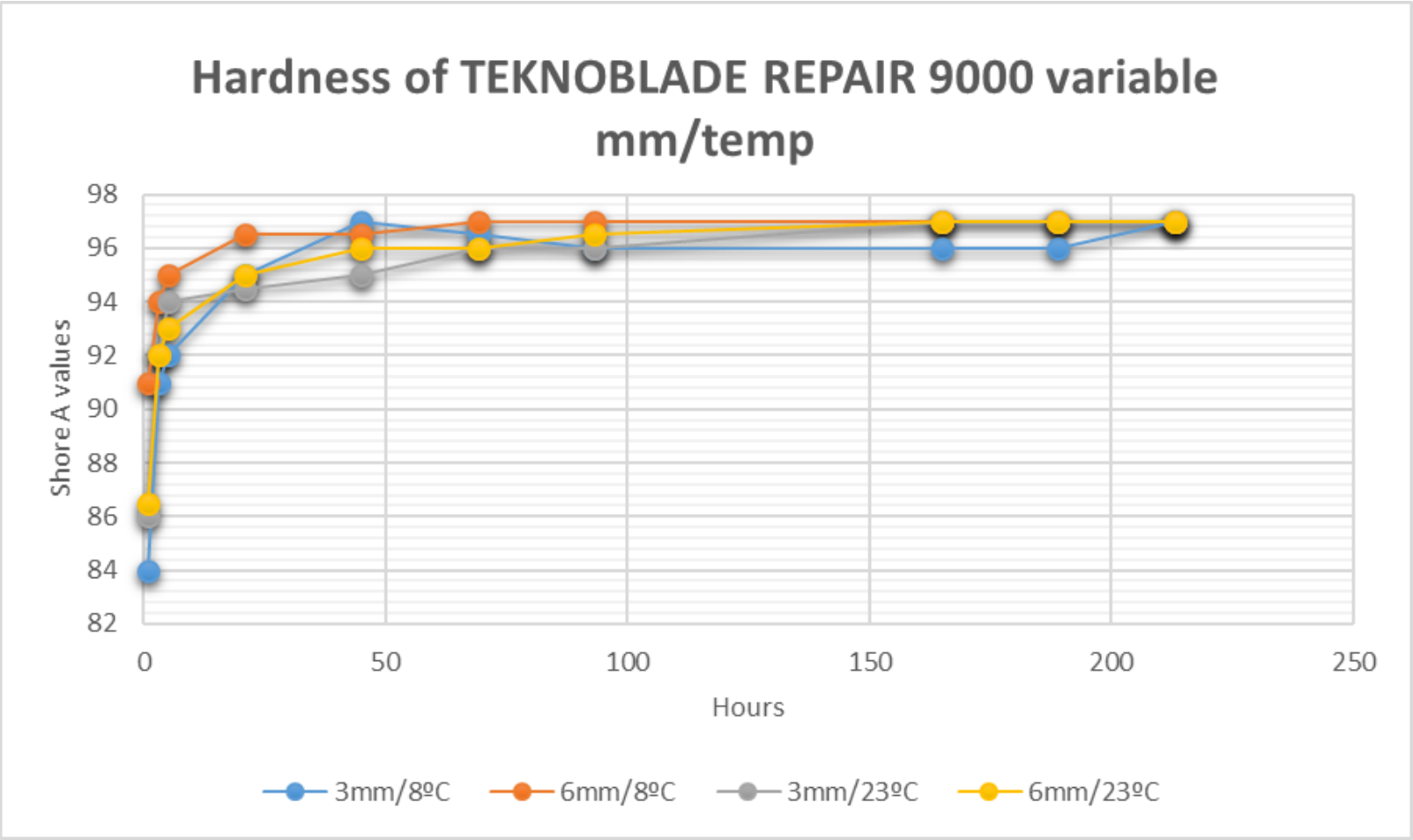
The solution

The TEKNOBLADE REPAIR 9000-10, a manually applied polyurea coating.

- Application with a caulking gun (battery powered) and a spatula
- Single layer of 2000 µ +/- 500 µ, recoatable when needed
- Cures within minutes to an impact resistant coat
- Wide application window 5^{o}C - 35^{o}C, air and substrate temperature
- Elongation (ISO 527-2) > 500 %
- Adhesion to GFRE (ISO 4624) > 5 MPa
- Ultra-low water up-take (up to 70^{o}C) < 2%
- RET, time to break trough (DNVGL-RP-0171_2018) > 10 hours@130m/sec
- Easy on-site quality control by shore A hardness measurement

The solution

Hardness development by curing, at different thickness and temperature



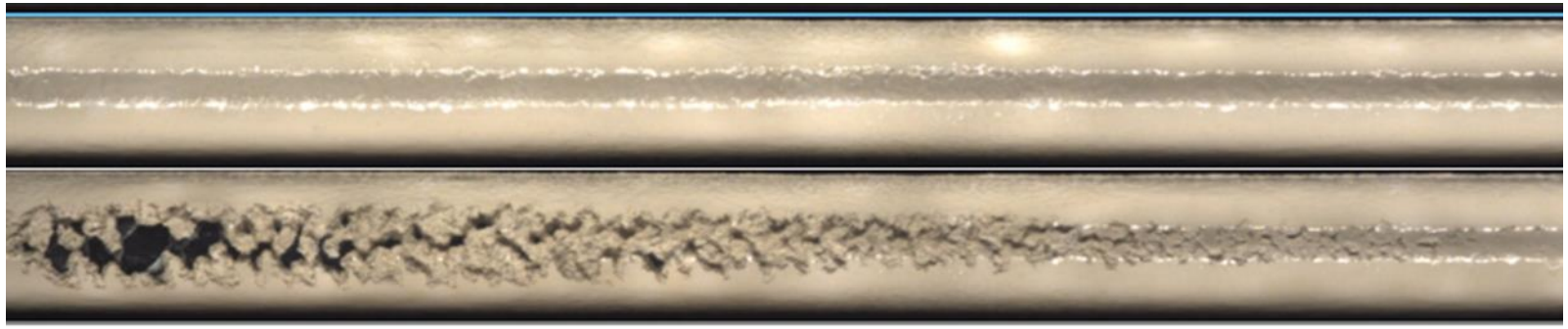
Shore A hardness

1 hour: > 80

24 hours: > 90

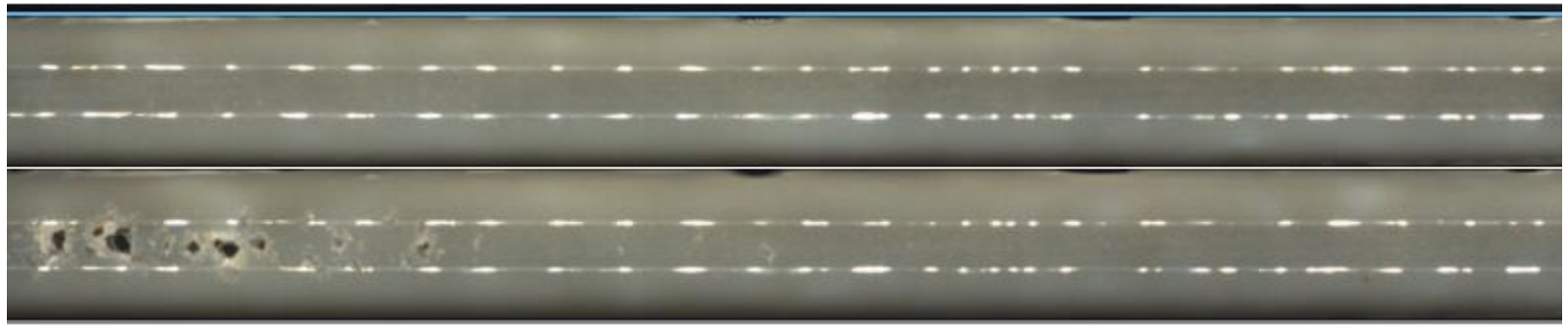
The solution

- Conventional breakdown of LEP product in Rain Erosion Test



Progressed erosion by spread from high speed end of sample

- TEKNOBLADE REPAIR 9000-10 after 21 hours Rain Erosion Test

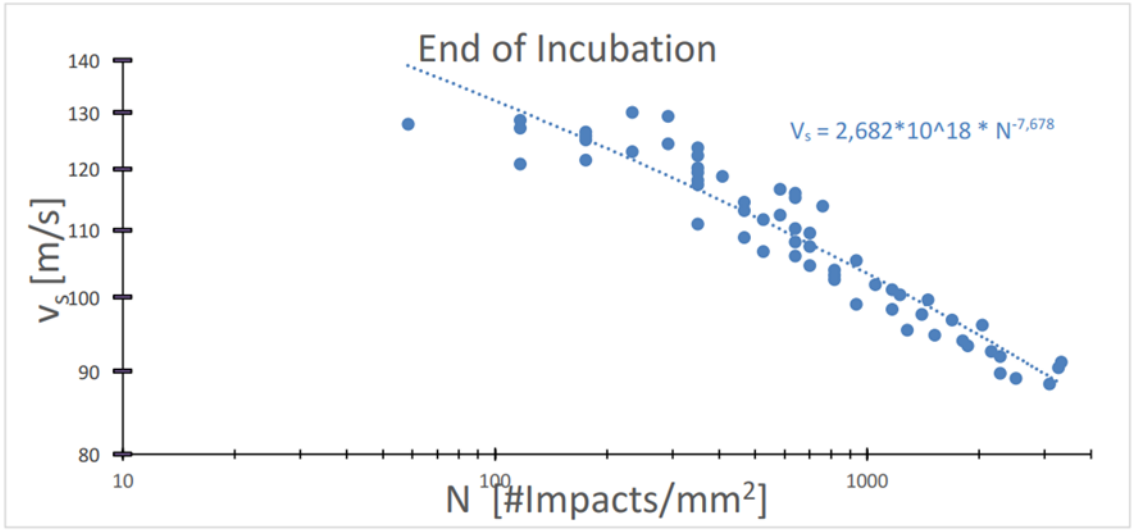


Isolated local erosion in high speed end of sample only (130m/sec)

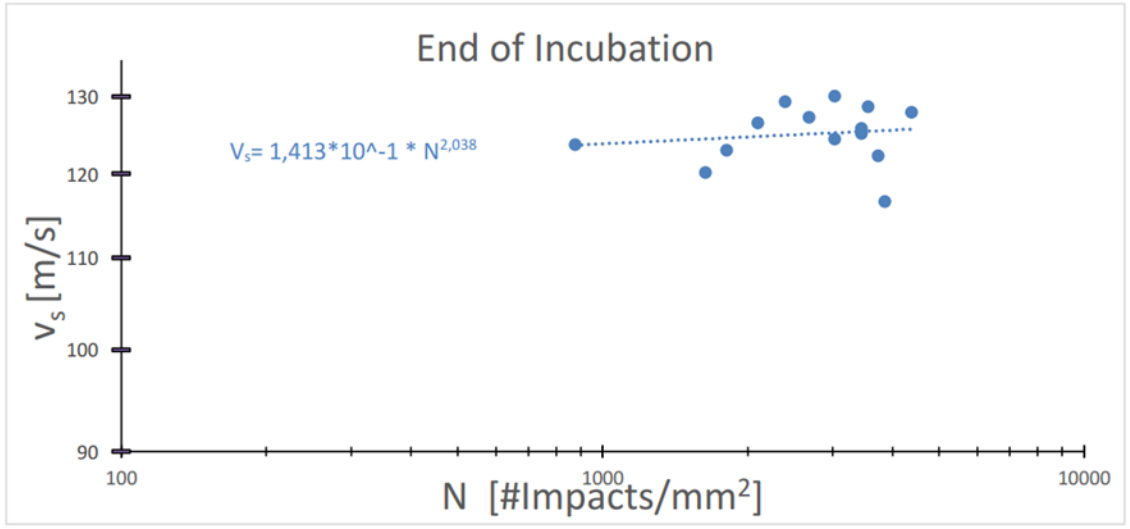
The solution

Two different erosion scenarios, RET in according with DNVGL-RP-0171

Conventionel LEP



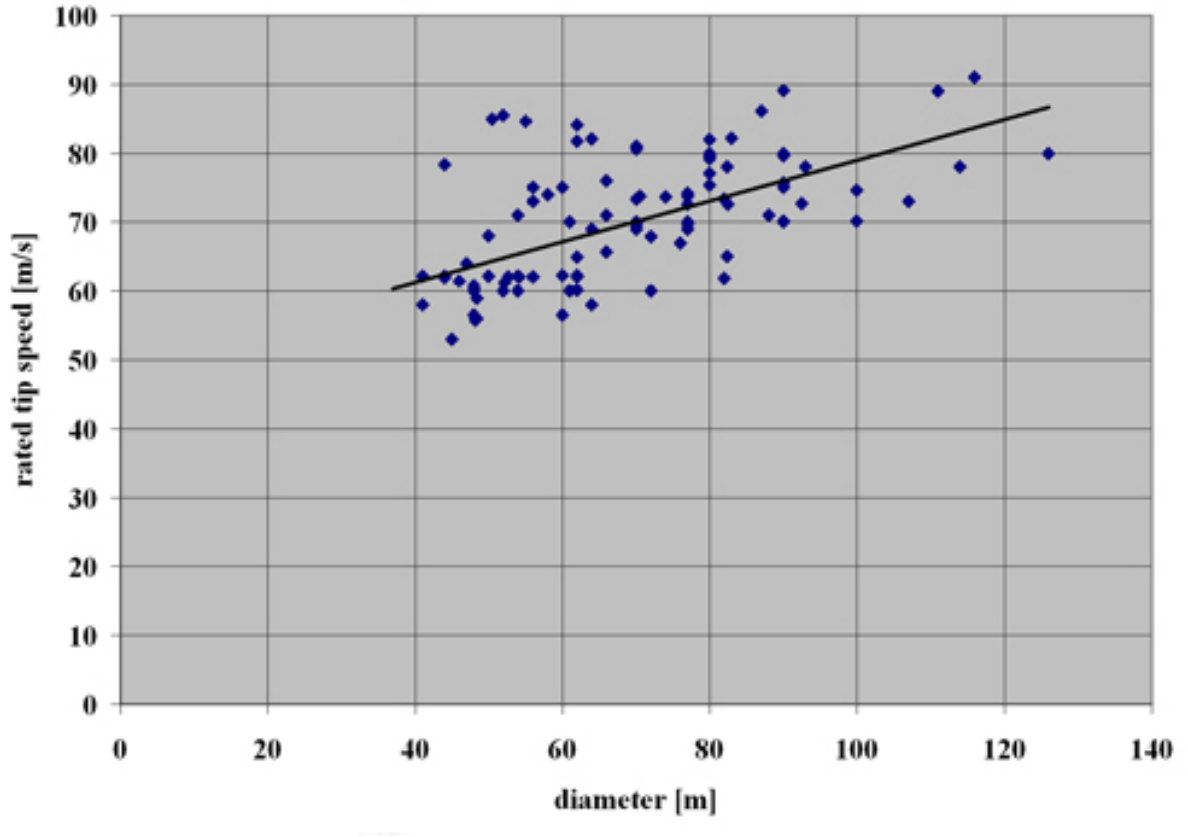
TEKNOBLADE REPAIR 9000



The solution

TEKNOBLADE REPAIR 9000-10, no visual sign of erosion: >21hrs@125m/sec

(rain intensity, droplet size, required durability, lack of correlation to sites)

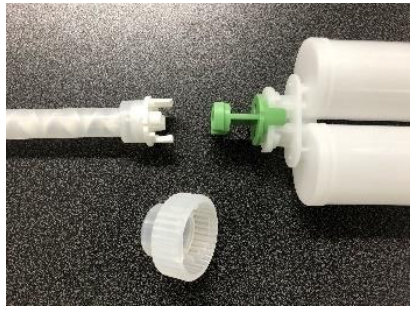


Source: Garrad Hassan

The solution

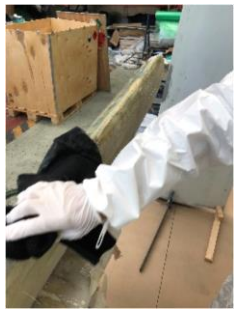
The application process (short video: https://youtu.be/BBvHmBV_mmU)



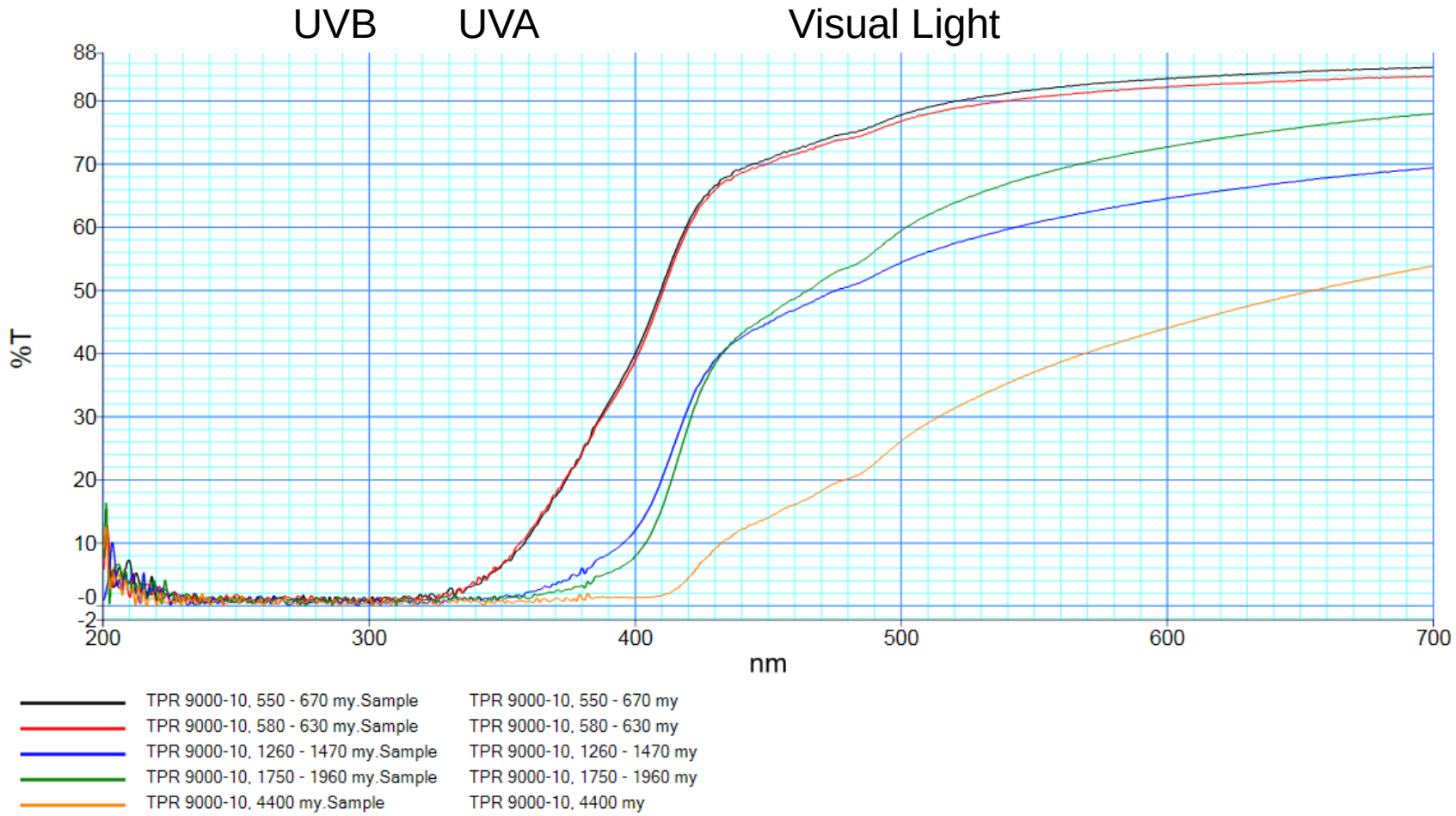









Light Transmittance of TEKNOBLADE REPAIR 9000-10



Applied on site

THE TEKNOBLADE REPAIR 9000-10 SOLUTION

Fulfillment of requests for solution and coating properties:

- One product solution (filler and LEP in one product) ✓
- Easy to apply, also when accessing the blade by rope. ✓
- Fast cure solution to minimizes down time ✓
- Long service life ✓
- Easy on site quality control of coating (Shore A for curing control) ✓
- Safe and simple to use, with a minimum of personal protection (PPE) ✓

Other products in the Teknos Blade series

TEKNOPOX PUTTY 2118 — Epoxy Putty for damaged areas

(Manually applied epoxy putty for surface fairing and filling of defects prior to painting)

TEKNODUR PRIMER 8-00 — Primer coat, min. 60µm DFT

(Polyurethane primer for sealing and improved adhesion prior to application of topcoat)

TEKNODUR 3572-02 — Topcoat for basic zones, min. 80µm DFT

(A highly durable polyaspartic topcoat for low to medium abrasive exposure areas that cures within 2 hrs. (DNV certified (Appr. No. WP1520022) for Blades)

Please contact Teknos for other solutions e.g. pinhole fillers, waterborne and high solid products, cleaner agents and etc.

What the future will bring

- TEKNOBLADE REPAIR 9000 with
- A selection of Shades
- Prolonged geltime → longer time to apply
- Improved rain erosion test


Thank you
Steffen Hawkins
Anders Nyboe