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NORNER NEWS 10

MDO films – Thinner Stronger Better

CO_2 makes plastics industry greener

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Innovation through Insight

Leader

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KRISTEN KJELDSEN

Hi, I am one of Norners microscopy experts. I can help you to solve problems related to production and product quality or investigate your claims.

SIW B. FREDRIKSEN

Hello, I am project manager for the "CO_2-to-plastics" project. It is very exiting to be part of such groundbreaking development.

JORUNN NILSEN

I lead the MDO-film project for development of more cost efficient and sustainable flexible packaging solutions. The project also work on how to optimise recipes.

Our polymer institute has been a development partner for packaging more than 30 years.

Tine Rørvik
CEO

Dear reader

Welcome to the first issue of our customer magazine. Our intention with this publication is to bring you recent news about us, our capabilities and some selected case stories.

Since Norner was established four years ago, as an independent plastics institute, we have been on an exiting journey.

Norner employees have experience in technology and international business development. We speak the same language as our customers, and provide accurate technical solutions that directly contribute to value creation.

We have established a base of customers and partners in Europe in all our core market and competence segments throughout the plastics value chain. Our key up-stream segments are chemicals, additives and polyolefin producers. Our downstream segments are plastic products for packaging, pipe, automotive and offshore.

Norner had a breakthrough in polyolefins and additives in Asia last year. This has lead to the establishment of Norner Mimir Ptv Ltd as a sales and advisory company in New Delhi. This will be our extended arm in our fast growing market in Asia. More than half of our growth is global, and many customers are large international corporations. It clearly shows that our expertise in the plastics value chain is very appreciated.

Our people are the foundation of our success and we have developed a healthy core business with a lot of motivation and pleasure. We have demonstrated this by our results and the satisfaction of our customers and partners. We in Norner look forward to continue cooperating with you in the future and demonstrating our company values:

Passion

Confidence

Impact

Imagine

Highlights

Polymer research

Norner has an advanced polymerisation laboratory where clients can have their challenges evaluated and tested.
Some recent highlights from the lab are:
Technology breakthrough in polymerisations with CO_2.

Polymerisation project and innovations in PVC.
New PE catalyst development projects
New investments in polyolefin catalyst synthesis

Packaging institute

Do you need an industrially focused plastics packaging institute? Norner has advanced laboratories for testing and analysis and several processing pilots for making packaging films and moulding prototypes.

We actively support your developments, help you improve product performance and reduce costs as well as care for your IPR.

Product Durability

Our laboratory and experts continously develop and expand our capabilities for testing of polymers and product durability. This include creep resistance, fatigue analysis, heat and weathering tests, corrosion, pressure, chemical exposure as well as flammability.

Food contact plastics

Norner offers migration testing of plastic materials, packages and articles intended to come into contact with food. This includes both overall migration testing according to EN 1186 and specific migration testing according to EN 13130. Furthermore we analyse additives in plastics qualitatively and quantitatively.

Norsok testing

Norner has extended its laboratory for ageing and weathering durability with accelerated test methods for qualification of systems for corrosive protection in offshore and marine sector. Norner offers qualifying tests according to Norsok M-501. This marks an important commitment to the oil, energy and marine sector. We are a leading provider of failure analysis and third party material testing.

On-line services

Did you know that our web include services which makes your day more convenient?

You can send your lab requests directly from our test selector.

You can use our online OTR simulator to speed up your packaging design.

You can enjoy our comprehensive property database for PE and PP packaging grades. It helps you to reduce development and product costs and dimprove product quality.

Check www.norner.no today!

Scientific laboratory

Our laboratories continue to invest add new analytical test services needed by our many clients. Some recent examples are: Thermal conductivity, Fatigue tester, UL lab, Migration and Odour test panel

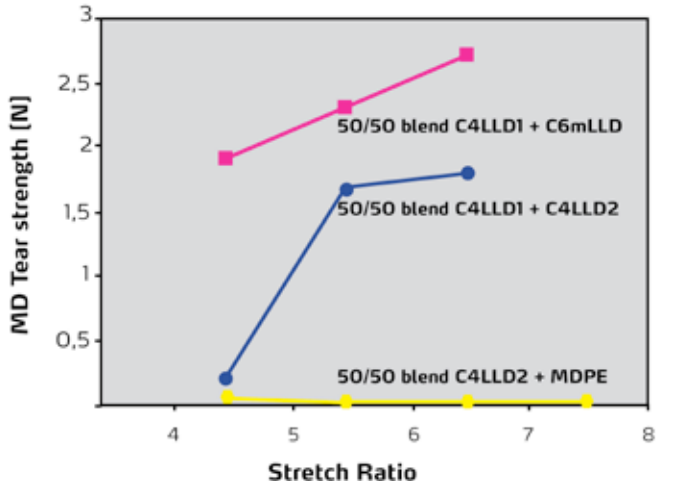
Best Eurostar

Nexam Chemicals and Norner wrote the highest ranked application in the latest Eurostar. The project will develop novel crosslinking tecghnology, and be performed togeher with ABB, Repsol and IRPC of Thailand.

FACTS

The advanced film development centre in Norner is well equipped with mono and coex blown film lines and an MDO line. This is furthermore supported by our advanced laboratory for material and film testing, microscopy investigations as well as polymer, chemical and organoleptic analysis.

MD Elmendorf tear resistance vs. Stretch Ratio in MDO line



MDO films
– Thinner Stronger Better

Are you also looking for flexible packaging with better cost and sustainable profile?

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One of the drivers for innovation in the packaging industry is the search for cost efficient solutions that balance the best achievable performance with the environmental position. MDO technology offers just that for the film and flexible packaging business.

Machine Direction Oriented (MDO) films as a flexible packaging substrate is one of the most recent packaging development trends. Our experts have been active in various film development projects for flexible packaging during the last ten years and Norner installed an MDO line in 2009 for research and development projects.

In an R&D project Norner is studying the performance of mono oriented films based on PE and PP grades. The work covers mono films, blends and coex structures as well as lamination and application trials. In order to take full advantage of MDO, the film industry has to redefine their understanding and competence in the performance of different materials and which synergistic effects can be achieved in blends and coex.

Come to Norner and take advantage of our competence and laboratory.

All categories of PE and PP film grades have been tested and several blends and coex films. vA key result from the research is how some polymers gain large improvements in properties while other does not. The graph illustrates the huge difference in performance of such blends.

Technically the MDO will improve the tensile and impact strength, creep resistance as well as optical properties significantly.

This leads to several commercial benefits like:

- Higher Package performance
- Less material consumption
- Cost reduction and improved sustainability
- Higher packaging line speed
- Less package breakages and product waste
- Enhanced product display and attractiveness

MDO is suitable for applications like; food pouches, consumer packaging, magazine wrappings, laminated films, liquid packaging, labels, shrinkable films, packaging of compressible goods and industrial bags.

MDO Case study – vegetable pouches

Norner has, together with a film producer, demonstrated up to 50% downgauging of packaging films for carrots. Compared to a 40µm BOPP film reference the 20µm MDO PE film has better overall strength and performance.

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BOPP films are a desired film for vegetables due to their high aesthetical performance and stiffness leading to a nice product presentation in the shop. A key challenge with the current 40µm BOPP films for packing carrots and potatoes is film breakage during the package handling due to the brittle nature of these films. This leads to significant down time, repacking and waste.

Our project proves that with a 20µm MDO PE film this problem can be reduced to a minimum and the packaging line could be run without problems.

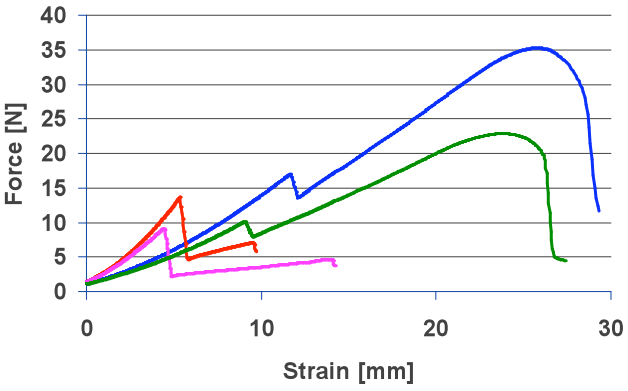
Key differentiators are the puncture and tear propagation properties of MDO PE vs BOPP. As shown in the graph, from puncture testing the films with a pyramid shaped indenter, the MDO films are not splitty. This means that even if a hole occurs, the film does not easily tear apart.

At the end of the day, less material is used, which is good for both the environment and your bottom line.

Flexible plastic packaging for food, consumer and industrial products is a large and important business. A wide range of films, laminates and packaging applications require specific physical properties for different demands. These properties are influenced by the choice of material type and grade, material recipes and additives, processing, lamination.

Norners film development centre provides efficiency, competence and test facilities for your development projects.

The pictures on next page are of the film production and MDO converting line at Norner.



BOPP 40 my
BOPP 25 my
MDO 20 my
MDO 30 my

CO_2 makes plastics industry greener

In the project "Plastics from CO2" Norner has already shown that up to 40 percent of the gas normally used to produce plastic raw materials, can be replaced with CO2. The project has also been testing out different applications for this type of plastic.

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Other ingredients may be based on fossil fuels, but Norner think these plastic materials in the future will largely be based on biowaste. This opens up a range of green patches.

Norner has several industrial laboratory reactors where the polymer is produced for this project with the relevant monomers and process parameters. Together with plastics processing lab and test centre, this enables us to take the lead in the research of both process technology as well as material science.

Norner have already established projects with leading international food producers to develop a more environmentally friendly packaging. The technology can also be used to replace raw materials in other plastics, such as polyurethane, and is thus becoming a truly green technology with many opportunities.
CO2 is used as one of at least two monomers in the production of the polymer. The properties of these new materials have so far been explored only to a minor extent and this field needs to have a high priority to ensure that such materials can be commercialized at a later stage.

CO2 is today one of the major challenges for the environment and stability in the world. Our approach is an alternative view on CO2 – as a raw material and not as a problem. CO2 is in fact a valuable, low energy raw material in this context.

"This is a unique possibility to utilise CO2 as a raw material in polymer production and thereby turn the problematic CO2 and environmental issues. Up to 50wt % of the polymer may be CO2. We look forward to this interesting challenge and will work hard to realise this opportunity to establish new and sustainable plastic materials" says Siw B. Fredriksen, project manager.

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Free web based OTR Simulator

Norner has launched an advanced and free online tool to calculate and simulate the oxygen transmission rate for packages and packaging materials.

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The OTR calculator is based on a calibrated simulation model developed by Norner. This simulation model estimates the oxygen transmission rate of plastics packaging material like PP, PET and EVOH.

The main objective of the simulator is to enable calculation of permeability for customer specific packages and geometries. The model has been verified by tests done on real packaging samples.

FLEXIBILITY AND FUNCTIONALITY
Calculations can be made for film, laminates and flexible packaging, round or square cups and bottles. Furthermore barrier properties of co-injection multilayer and in-mould-label solutions can be studied and evaluated.

The ability to vary the combination of geometrical options, permeability properties and environmental conditions provides a useful tool when working with the design, development and application of plastic packaging. This makes the model especially flexible and suitable for simulation of package designs and structural changes in the development phase.

"Interesting! I have already forwarded this to a client who is demanding such application for many years. This was enjoyable!"

Mr. Didier Houssier at EVAL Europe.

The user has the flexibility to specify number of layers, their thickness and the polymer in each. For the purpose of simulating real life situations it is also possible to vary the key environmental parameters such as temperature, humidity and oxygen concentration.

USEFULNESS
Fast investigation of "fit for purpose" for a given package on the market can be performed.

Simulation of OTR during packaging development and design phase is another way to use this tool. Any development project must consider the physical, aesthetical and functional needs for the customer and consumer – including OTR and expected shelf life for perishable products such as food.
The calculator can be used to simulate OTR for a range of realistic conditions for a specific package and thereby gain valuable insight in realistic O_2 levels in the package vs. time. This will provide an estimate of the estimated shelf life of a packaged product.

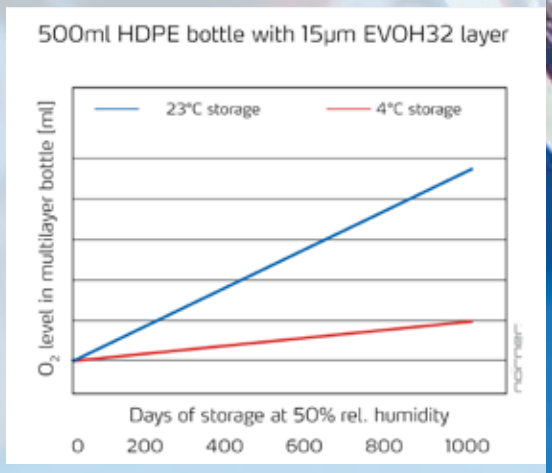
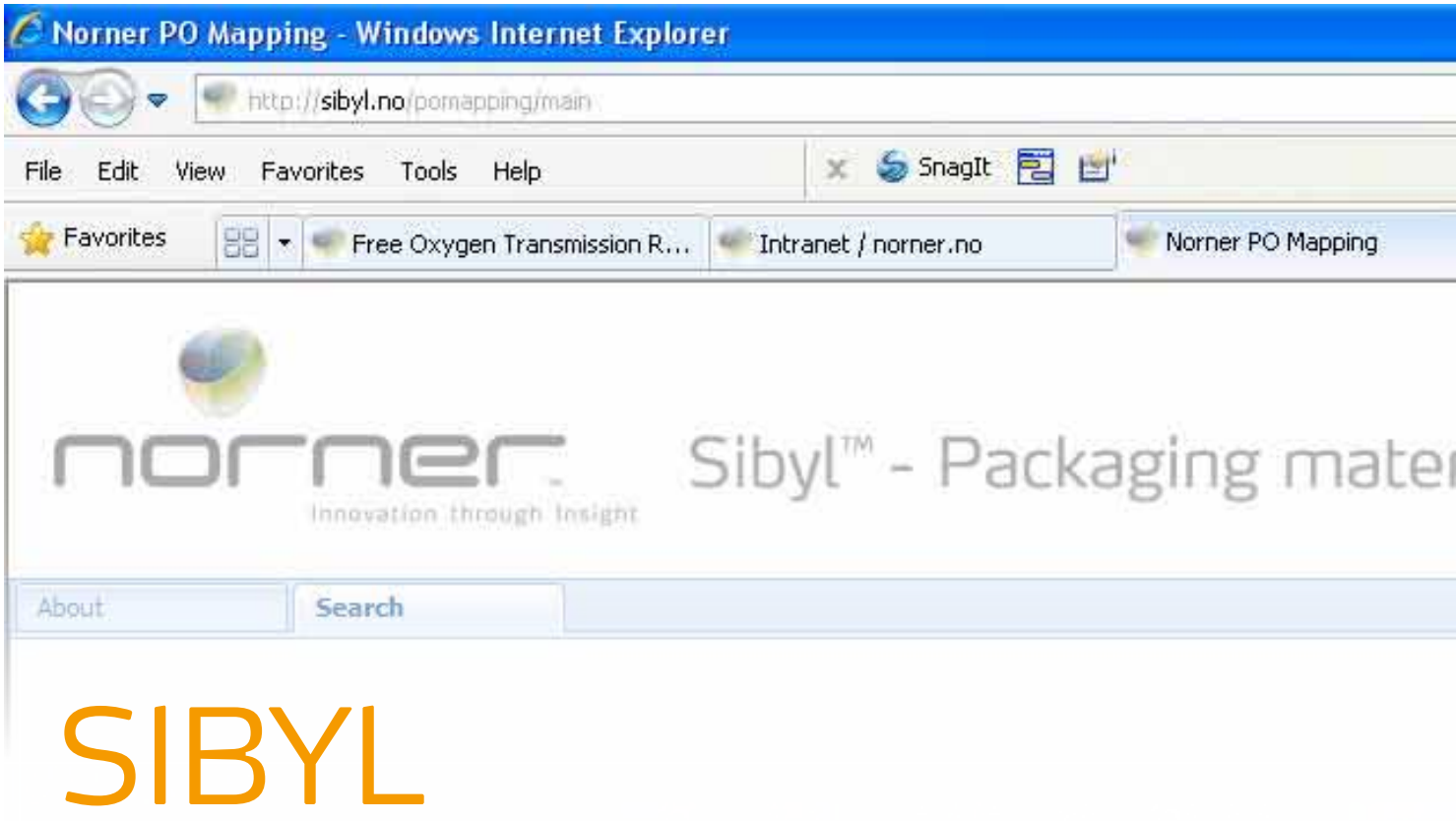


Figure: O_2 level in a multilayer bottle with 15µm EVOH layer at two temperatures, 50% rel. humidity as function of storage time



SIBYL

Sibyl is a new database created to give you a well of data that allows you to make real comparison of different grades of PE and PP for packaging applications.

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Sibyl.v1.0 is now available and contain essential polymer data as well as a wide range of application related tests and properties. You can compare products and make your own graphic presentation.

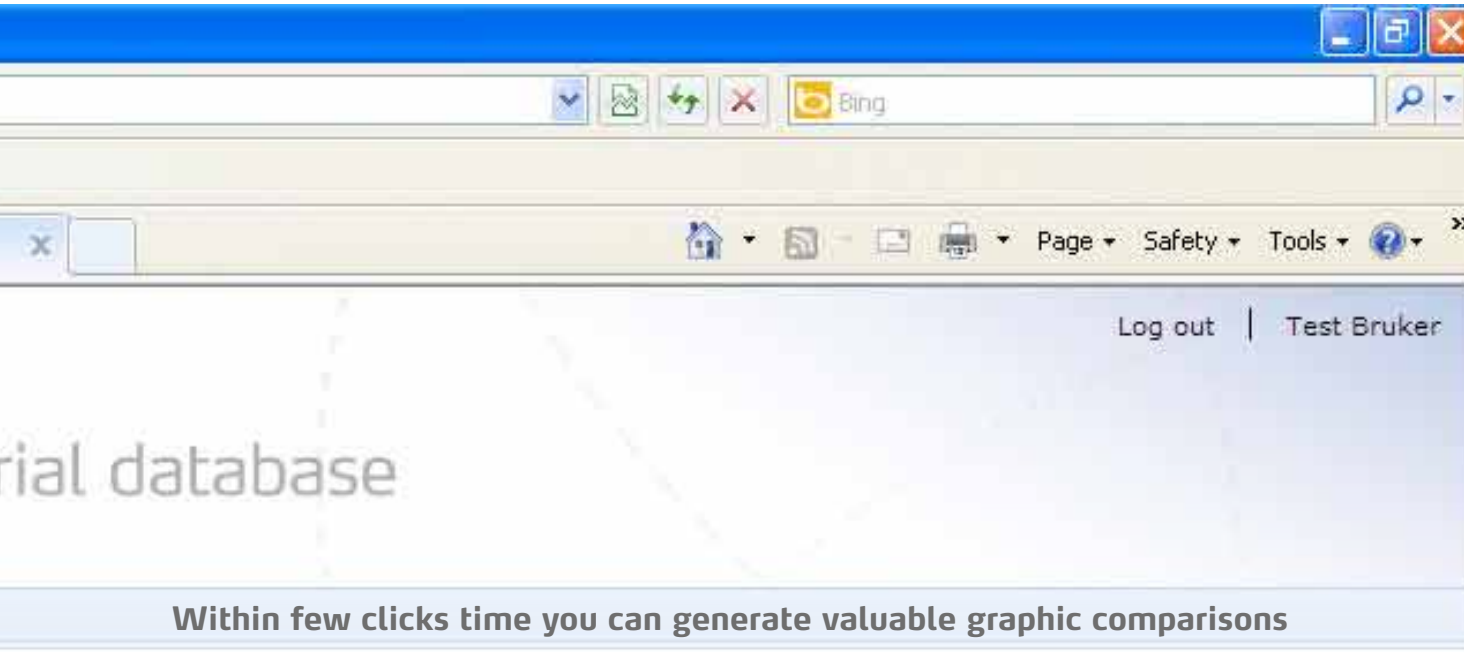
You can get access to this significant data through a subscription now offered at an introduction price. With company subscription all your developers and gets easy access to the database.

REDUCE YOUR COSTS
Real comparisons of products in the market give a direct value for quality assurance and product development. You can reduce own internal testing of grades and thereby save cost, gain speed and use R&D resources better. Furthermore you can identify alternative suppliers, better performing grades or avoid costly "over engineering".

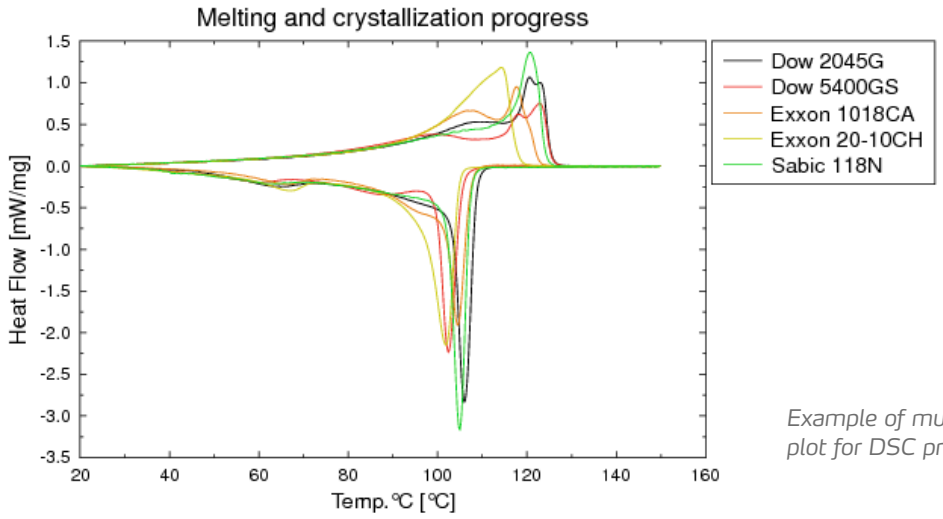
IMPROVE YOUR PRODUCT QUALITY
Are the alternative grades used in your application sufficiently similar or with the optimal properties? Alternative suppliers may offer what you need for high quality. Sibyl offers you the insight and reduces thereby your risk when selecting grades.

COMPREHENSIVE DATA
Sibyl contains polymer data ranging from MFR and density to rheology, DSC amd FTIR curves. Furthermore it contains a wide range of film and moulding specific test data. All products have been processed and analysed at Norner at equal conditions. This ensures the quality, reproducibility and your confidence in the database.

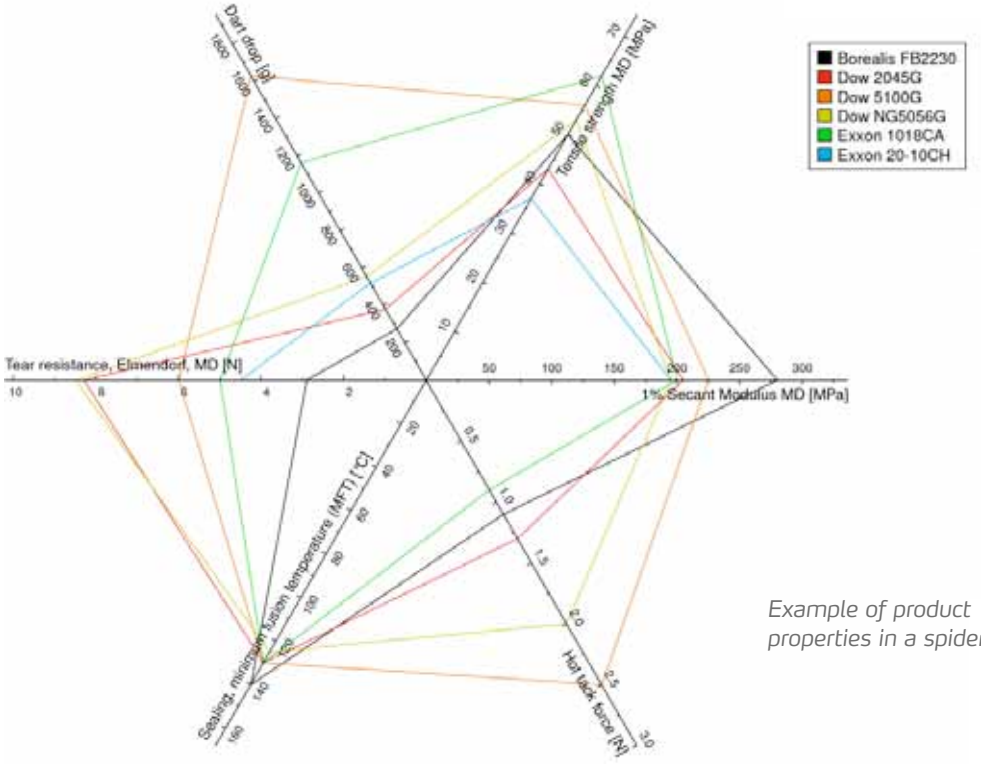
EASY TO USE DATA BASE
Sibyl database is easy to use. The first process is to search for the right product, polymer and application followed by final selection of grades and properties. The data is easily viewed in a table of the selected products and properties.
Several graphic options are available based on the selected data. You can generate graphic overlay plots of rheology, DSC or FTIR curves. Furthermore XY plot, histogram and spider graphs of product data can be generated. All graphics can be downloaded as picture files for convenient later use in your presentations or reports.



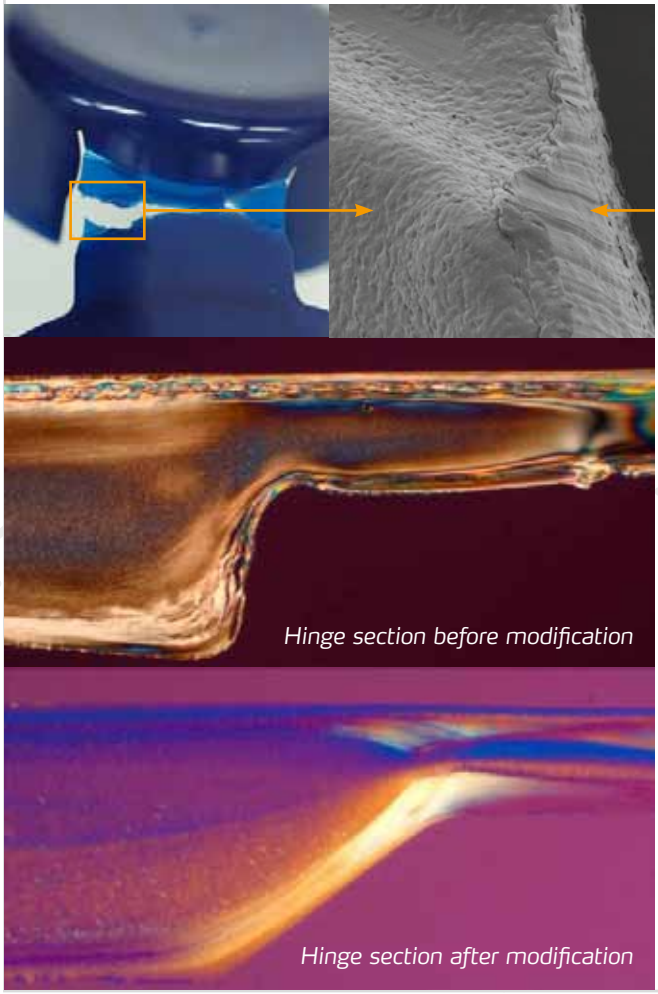
Within few clicks time you can generate valuable graphic comparisons



Example of multipoint data plot for DSC properties.



Example of product properties in a spider graph.



At the back

Norner can be your best partner for troubleshooting, failure investigations and claim handling.

Here we present to you a case of breakage in flip caps – a customer problem we helped to solve. We analysed the problem in our advanced microscopy lab, identified the root cause and proposed improvements.

ROOT CAUSE ANALYSIS

- Strong orientation in shear zone giving delamination
- Damages in hinge from demoulding in machine
- Radius transition zone between hinge and cap is too sharp

SOLUTION/CONCLUSION

- Mould changes in critical radius
- Re-polish mould at inside of hinge
- Change to material with higher MFR

Next issue

Norner accredited services for pipe testing
Polymerisation lab capabilities

NORNER**NEWS**

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