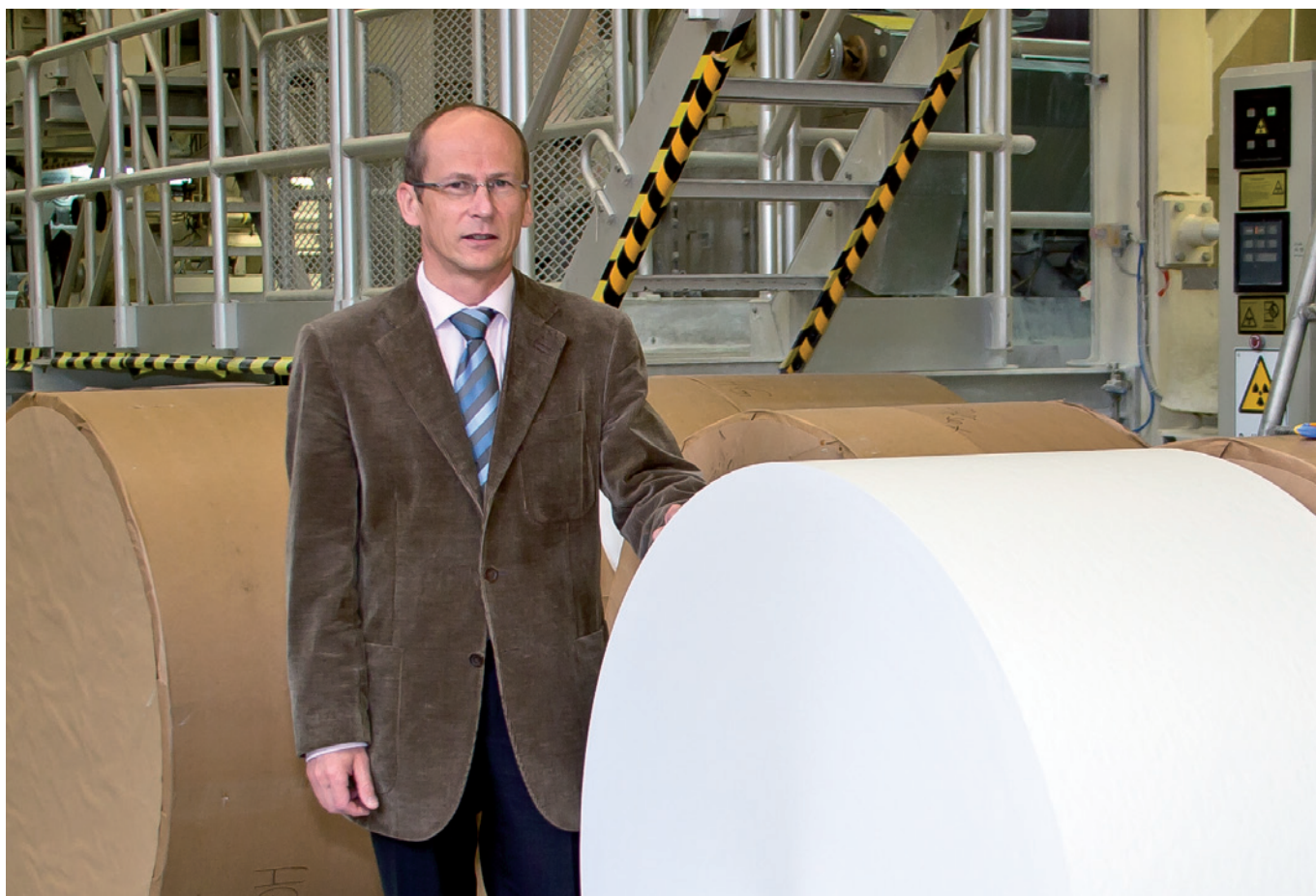


ANNUAL REPORT 2010





*„Paper is and will remain a fascinating material. We are determined to further exploit its potential and open up new applications.“*

## 2010 – A YEAR OF CHANGE

The paper industry is in a state of change and faced with enormous challenges in all parts of the world. After suffering a decline in 2008, 2009 and 2010, the production volumes of paper, paperboard and board as well as products based on them have been restored to pre-crisis levels with surprising speed. However, a closer look at the figures reveals a somewhat different picture: not all product groups have benefited equally from the economic recovery, and the profit situation of some companies continues to be rather critical due to soaring energy and raw material costs.

The picture reflects our experience with research and development spending. Investments in traditional applications like coated papers will decrease in the medium and long term, whereas the demand for new, innovative applications of paper can be expected to grow strongly. Being an innovation driver, we are focusing increasingly on customers of the paper sector. Manufacturers of lifestyle products and premium cosmetics, the food and luxury food sectors as well as the pharmaceutical industry are looking for new functions to perfectly present their products at the point of sale. Its many design options, excellent printability and ecological advantages make paper a high-quality packaging material for these applications.

But we see promising opportunities also in areas outside the traditional paper markets. Combinations of natural fibres with other components lead to fibre composites offering entirely new properties. Examples of these innovative PTS products are highly filled papers with ceramic and metallic characteristics for light-weight construction elements, or novel safety papers providing protection against product piracy.

As a research company, it is our mission to speed up innovation and open up new

application areas for paper. There are already very promising developments in the car and construction sectors as well as with filter manufacturers.

Our approach demands research to be done within value networks. This must be borne in mind when we select our main research topics and the services we want to offer to the various sectors. We have been working profoundly on these strategic tasks since 2009, and are determined to conclude the process in 2011, the year of our 60th anniversary, by presenting a future-oriented market profile and new corporate identity.

The successful management of change requires a sound economic footing. After making losses for two years in a row, PTS achieved the turnaround in 2010. Worth mentioning is also the significant cost reduction we have managed to achieve. Being a clear indication of our employees' strong motivation to perform, the cost savings have greatly improved the efficiency of PTS.

It is gratifying to see that we have managed to add new clients from outside the paper chain to our traditional customer group – especially in the field of contract research. This has created the basis for long-term co-operation. Including also the end customers or buyers of paper products will provide fresh impetus for innovation within the paper chain.

We have managed to modernise and extend our technical infrastructure despite the difficult economic situation – especially at the institute in Heidenau. This was made possible, among other, by a special investment programme launched by the German Federal Ministry of Economics and Technology. Extending the laboratory and pilot plant facilities of PTS also remains one of our key tasks in 2011, as it will safeguard our future. We are planning investments in Tera-Hertz measuring technology, a promis-

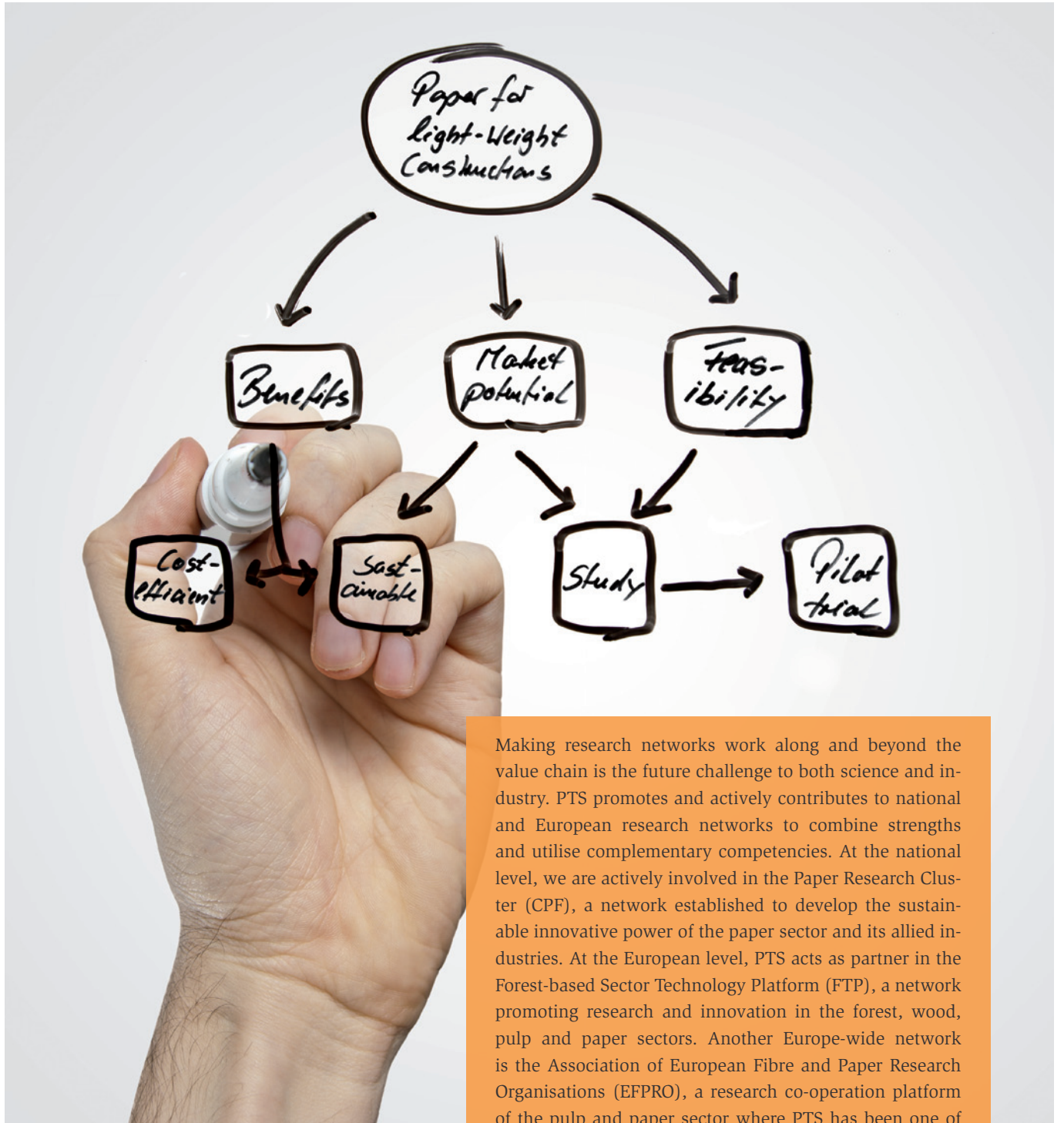
ing new approach to determining quality parameters for the paper industry. The conversion and modernisation of the paper technology pilot plant will greatly benefit both our customers and our own research. It will add new opportunities to our broad spectrum of product and process developments, which is unparalleled in Europe already. In combination with improved mathematical models, the new pilot plant facilities will enable us to offer our customers successful scale-ups for industrial applications.

2010 also was a highly successful year regarding our co-operation with other institutes. Joint work in the Paper Research Cluster has generated new and far-reaching project ideas. Their joint realisation will be a challenging task in the months and years to come. We firmly believe that by bringing together interdisciplinary, cross-sector competences, we will be able to develop entirely new solutions for the paper chain and other sectors – especially on the way to establishing a bio-economy.

With our new strategic orientation, a flexible business model integrating research and development, new and powerful partners as well as state-of-the-art instrumentation, we are well-equipped for the challenges of the future. Paper is and will remain a fascinating material. The future task is to further exploit its potential and open up new applications. We look forward to developing innovative solutions together with our partners from science and the industry. ■

**Dr. Frank Miletzky**  
President

# CONCEPT PHASE



Making research networks work along and beyond the value chain is the future challenge to both science and industry. PTS promotes and actively contributes to national and European research networks to combine strengths and utilise complementary competencies. At the national level, we are actively involved in the Paper Research Cluster (CPF), a network established to develop the sustainable innovative power of the paper sector and its allied industries. At the European level, PTS acts as partner in the Forest-based Sector Technology Platform (FTP), a network promoting research and innovation in the forest, wood, pulp and paper sectors. Another Europe-wide network is the Association of European Fibre and Paper Research Organisations (EFPRO), a research co-operation platform of the pulp and paper sector where PTS has been one of the founder members. Further, we co-operate closely with companies from the supply sector in the Paper Technology Research Association (FPT), and with paper converting firms in the Paper Technology Foundation Research Association (FPS).

*How can one generate creative ideas? Sometimes by looking beyond one's nose and into other sectors, sometimes by dealing with urgent problems of the industry – but always by leaving the beaten track and thinking the “unthinkable”.*

## Paper in vehicle construction: A new, multifunctional composite

Cross-sector research networks have enormous potential to develop innovative ideas. This is shown by the example of a new, multifunctional paper-sheet metal composite. To be used as thin-walled, high-strength body sheet for vehicle construction, it is expected to improve the car's vibration characteristics and noise attenuation. Cellulose fibres used as substitute for petrochemically based synthetic fibres are more environment-friendly and expected to save significant amounts of production energy.

The project idea was born during pre-tests performed at the chair of forming and primary shaping technology at TU Dresden. Being the project co-ordinator, PTS contributes specialist knowledge of plant fibre structures and is developing a three-dimensional fibre-based moulding. Brandenburg University of Technology in Cottbus, the third project partner, is responsible for impregnation and the realisation of adhesive joints in the composite. Renowned companies from the paper, automotive and sheet metal working sectors are represented on the project committee.

The persistent scarcity of resources will further increase the demand for multifunctional, light-weight composite materials. Thin-walled, high-strength body sheets for vehicle construction offer enormous potential for significant material savings, weight reductions and higher energy efficiency. Replacing a 0.8 mm thick steel sheet in the bonnet or roof with a composite comprised of paper and 0.3 mm steel sheet would lower the weight of the car by approx. 15 kg. This would reduce fuel consumption by 0.1l/100km. Further benefits are the improved environmental compatibility and recyclability due to the use of renewable raw materials. ■

## New type of product protection against brand name piracy

The attacks of product pirates are no longer limited to brand manufacturers of perfumes or sportswear – pharmaceuticals, shoes, accessories and increasingly also food and beverages have become almost ordinary targets. Imitations tend to come in packages that look so authentic that the user cannot tell the difference between genuine and falsified product – a fact that causes serious damage to brand names and corporate images. Apart from the products, counterfeiters also imitate the accompanying safety labels and packages. The market for highly sophisticated anti-counterfeiting technologies is therefore very large already and will continue to grow in future.

In a recently concluded research project, PTS scientists have developed a transparent ink that can be used as a safety feature for counterfeit protection. The completely new type of product protection is based on antigen-antibody reactions using nanosol immobilisation on paper. Bio molecules are used as markers that can be identified by means of specifically reacting antibodies in a rapid colour reaction test based on the induced fit concept (lock-and-key principle). Sol-gel materials based on SiO<sub>2</sub> serve as matrices for the molecules - they are perfectly suitable for the immobilisation of bio molecules. The detection reaction is highly specific, and the code can only be cracked by an extremely difficult and expensive protein analysis. The transparent safety feature can be applied directly on other safety features to provide extra protection. The printing ink has a shelf life of at least three months. Once applied, the safety feature is highly specific and effective and can be verified for at least four months by means of a simple rapid test system. The transparent printing ink has been optimised for both inkjet and flexo printing. ■

## Big results with small fibres: Nanocellulose in paper

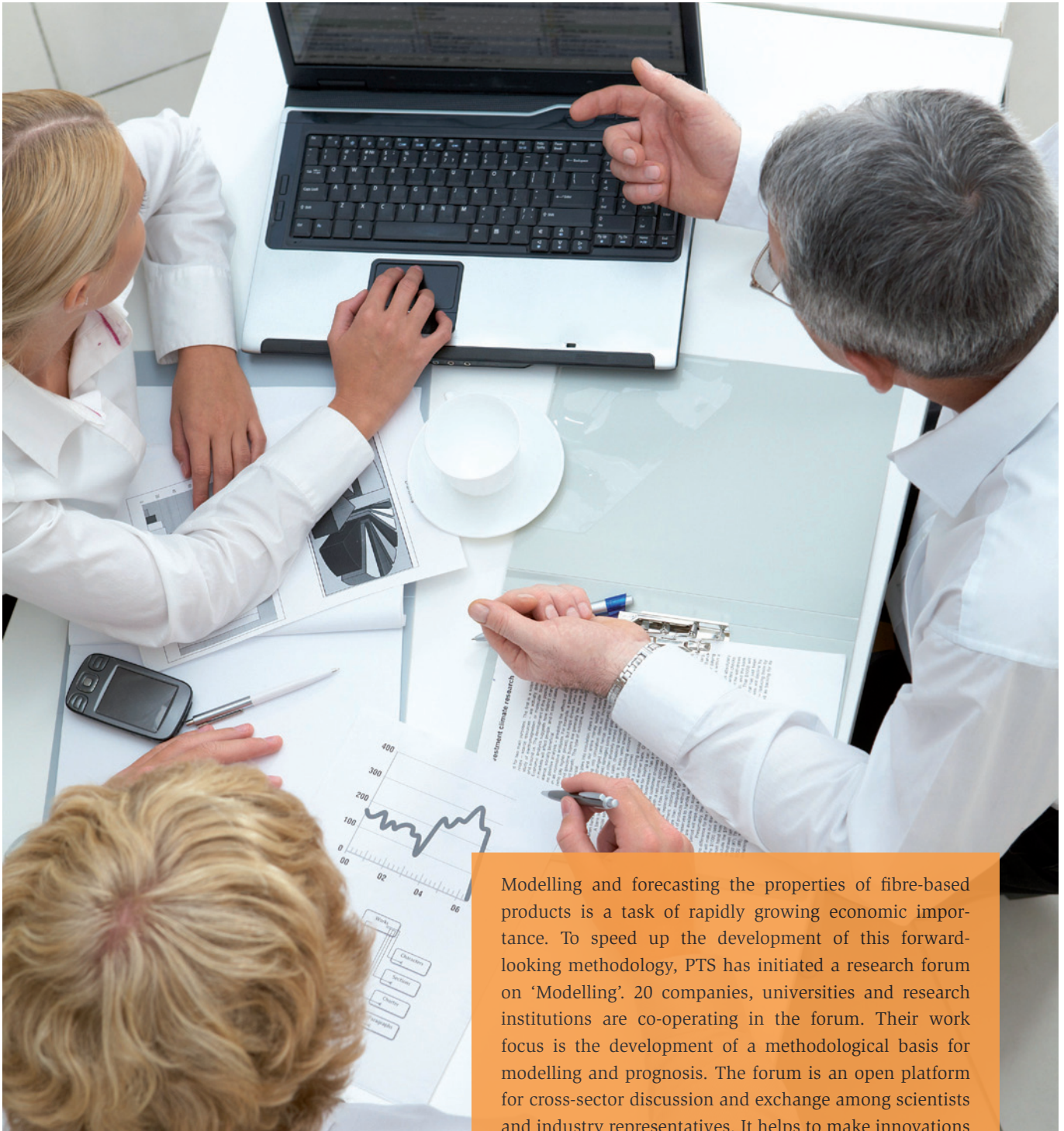
Surface and internal strength, barrier properties and sustainable product design at a previously unknown level – these are the catchwords outlining the benefits of nanocellulose in paper. Paper thus has a good chance of succeeding in the future markets of packaging and composite materials.

In various co-ordinated projects, PTS scientists are developing these ideas to production stage. A great challenge is the conflicting aims of ensuring the economically efficient production, utilisation of high specific surface and reliable processing of nanocellulose as internal or surface material.

Regarding issues of nanocellulose production, PTS relies on established technologies. Their capacity and technological conditions make them more suitable for this purpose than laboratory or pilot-scale solutions. Together with partners from the machine construction sector, the technologies are being implemented in paper mills.

To use nanocellulose in the pulp, PTS has developed special solutions counteracting in particular the impaired dewatering. Together with our partners, we have demonstrated that suitable chemical modification in an aqueous medium or elegant dosing of cationic additives can further enhance the performance of nanocellulose without adverse effects on dewatering. Moreover, the close cooperation with paper producers has led to an increased efficiency of expensive sizing and greaseproof agents as well as strength improvements. ■

# DEVELOPMENT PHASE



Modelling and forecasting the properties of fibre-based products is a task of rapidly growing economic importance. To speed up the development of this forward-looking methodology, PTS has initiated a research forum on 'Modelling'. 20 companies, universities and research institutions are co-operating in the forum. Their work focus is the development of a methodological basis for modelling and prognosis. The forum is an open platform for cross-sector discussion and exchange among scientists and industry representatives. It helps to make innovations in the fields of pulp and paper available to companies, thus enabling them to offer completely new or strongly improved properties to succeed in the competition with other materials.

*Modern laboratory equipment and accurate scientific methods play a key role in the development of project ideas. If their existing equipment is no longer sufficient, laboratories must pursue different paths. Simulation and modelling approaches will become increasingly important in future.*

## Effluent treatment by means of algae and bacteria

Water is an indispensable resource as well as a key production and cost factor in the pulp and paper industry. The limited availability of fossil fuels, soaring energy costs and increasingly stringent environmental requirements demand innovative solutions for water and energy management in the paper industry. At the same time, it is important to reduce CO<sub>2</sub> emissions, which contribute significantly to greenhouse gases and cost a lot of money for emissions trading.

ALBAQUA is a joint European research project of PTS and partners from Belgium, Slovenia and Hungary aimed at studying potential applications of algae in the paper industry and its allied sectors. Conventional aerobic treatment techniques for wastewater are to be improved by the use of symbiotic algae-bacterial biomass. Micro algae forming a symbiosis with activated sludge organisms can improve the ecological and economic performance of existing techniques: They are capable of ensuring both the oxygen generation for heterotrophic processes and the higher absorption of nitrogen and phosphorus by biomass. Autotrophic algae need carbon dioxide, which is an end product of the aerobic oxidation of carbon by bacteria. The symbiotic gas exchange interactions between algae and bacteria are systematically used for wastewater treatment. Under ideal conditions, this can even lead to energy savings.

A specific 4-line laboratory system has been developed for this project in the PTS pilot plant in Munich. Its lines can be operated in parallel and under identical process conditions. By means of this plant, scientists have generated stable algae-bacteria biomass that can be used in wastewater treatment. Degradation rates

and settleability are satisfactory; there is no need for aeration. Work is under way to further study the operating conditions and limits of and identify the wastewater types suitable for the mixed algae-bacteria biocenosis. Pilot trials in a Slovenian paper mill are planned for the summer of 2011.

First results have been presented to a broad expert audience at the 4th federal get-together of algae experts in Hamburg, and have met with a very positive response. ■

## New product design through simulation and modelling

Developing modelling methods and simulation tools for the calculation of paper properties is one of the core competencies of PTS. Together with universities and other research institutes, PTS does intense research on the virtual design of fibre-based materials. The simulation tools are used to optimise the manufacturing process and mechanical and optical properties of paper, and to develop innovative fibre products. On this basis, PTS scientists develop customized solutions, assist with their application on site, or make them available via the Internet.

The ProductOptimizer, a modular simulation tool, is a typical example of successful PTS work in this area, enabling customer-specific solutions to be developed by means of a common web-browser based user interface. The tool integrates customer-specific process and paper models as well as modules for cost calculation and the administration of simulation scenarios.

An integrated scenario manager makes it possible to evaluate new technical features by automatically calculating vari-

ous implementation options. Individual variations can be simulated to display the achievable product properties and product costs induced by them. The optimum variation is identified by means of suitable optimization strategies and thus helps to reach decisions in strategic projects.

The ProductOptimizer has already been successfully used for technology assessment and product development in various customer projects. Its application in a corrugating stock production to optimize fractionation and refining stages by means of simulation has led to a 10 % increase in short-span compression strength (SCT).

The efficiency of the simulation tool has also been shown in a customer project on paperboard development. A new product with 80% higher flexural strength could be developed and successfully marketed much faster than by conventional procedures.

The outcome of simulation tools is essentially determined by the reliability of the models used. The validity and practical relevance of PTS models were proven by a research project. The validation method developed in this project is in continuous use by PTS experts to improve our existing models and to develop new ones.

In several publicly funded research projects, PTS scientists are currently developing models for multi-layer packaging papers and for deinking. ■

# IMPLEMENTATION



*“Full-scale implementation would have been impossible without the technological pre-tests and fundamental trials on the VESTRA pilot coater”*

Reinhard Knop, Horst Sprenger GmbH

*„We are working with VESTRA because we appreciate working with true professionals. Besides, you really have the best ‘Caffe Latte Macchiato’ here!*

Josef Gombocz, Mayr Melnhof Karton Frohnleiten

*„Testing important paper-technological processes on pilot scale is the main benefit we get from the pilot plant at PTS Heidenau. The team’s great professional competence makes sure that the desired parameter settings are realised systematically and that we get paper and stock samples of high informative value. This enables us to assess the feasibility of the solution and estimate the properties achievable by the papers.“*

Ulrich Mallon, Koehler Greiz GmbH & Co. KG

*„The pilot plant facilities at PTS Heidenau, for example the pilot paper machine, permit a relatively high number of parameter settings to be run during one working day and with relatively small amounts of time and material. The PTS team is highly experienced and always ready to realise also entirely new ideas and tasks.*

Maximilian Laufmann, Omya International AG

*„We have been working with PTS in the multi-client project on ‚Flame-retardant paper’ for approx. 10 months. The co-operation in this project has been excellent so far, and we already got a number of exciting new starting points. The project results achieved to date are very promising, and we are eager to see their application in products!“*

Prof. Dr. Hans-Ulrich Hummel, Dr. Shoko Frey-Matsuyama, Knauf Gips KG

*The transfer of laboratory results and simulation models to full-scale applications can involve high risks. Testing them on the pilot scale beforehand can lower these risks. It reduces the time required for marketing new products and integrating new processes into production.*

## Fire protection by means of paper-based construction materials

The technological infrastructure of PTS Heidenau offers opportunities for product and process development that are unique in Europe – from lab-scale trials to prototype production in the paper technology pilot plant.

The development of ecologically and toxicologically harmless flame-retardant papers (building material class B1 in accordance with DIN 4102-1) is an example of this. Besides meeting the requirements of current fire protection classifications, the papers were to be produced on conventional paper machines by resource-saving, cost- and energy-efficient processes.

Starting point was a literature and patent search conducted by PTS to study applicable standards and regulations on fire protection and derive the future requirements to papers against the background of new European standards.

Fillers and additives provided by the project consortium were tested on lab scale to investigate their potential contents in the paper and how they should be handled in the papermaking process. Fillers, additives and the stock model were selected based on the physical test results of handsheets produced by a laboratory sheet former.

The next step was tests on a pilot paper machine aimed at forming a continuous web of flame-retardant paper. Issues to be clarified here were the influences on retention and dewatering and effects on formation. Samples for acquisition purposes could already be successfully produced. The project results are currently being evaluated to prepare the final report. ■

## Increased surface strength of highly filled papers

Studies performed at the paper technology pilot plant in Heidenau in recent years have shown that the initial wet tensile strength of highly filled papers can be ensured by suitable additives and refining. However, the additives could not – or not sufficiently – increase the surface strength (picking, dusting) of the papers.

A multi-client project was launched to overcome this drawback. The consortium of industry partners and PTS had set themselves the goal of increasing the filler content of papers by 10% whilst ensuring the initial wet strength and surface strength.

To start with, the partners investigated the relationships between filler type (shape, particle size distribution, dispersing result), pulp refining and the use of surface strength-enhancing additives.

At the end of 2010, screening tests of various additive and filler systems were done on the pilot paper machine of PTS, using different refining parameters and two stock models. The additive systems used were found to reduce the surface dust of uncoated wood-free paper. The filler effect was comparatively low in this paper, whereas filler systems were found to cause a significant surface dust reduction in the SC paper.

Based on these results, PTS scientists did optimisation tests of two additive and filler systems each for every additive and filler producer involved in the project. The next step was a comprehensive characterisation of the test papers produced. ■

## From the ‘drawing board’ to the paper machine

Optimisation tests for paper coating have been successfully conducted on the VESTRA pilot coater of PTS Munich for many years. However, planning new developments jointly with machine builders and paper producers and developing them to the point of practical application is a rather unusual and therefore particularly challenging task for the VESTRA team.

A paper producer intended to convert its metering size press to a film press. The company was looking for support and advice as well as a possibility to run tests on a pilot coater. Greatly varying web widths on their paper machine – a result of converting requirements – demanded a reliably and permanently functioning, cost-effective film press concept making it possible to adjust the working width as necessary.

The company Horst Sprenger GmbH in Moers conceived a solution based on specially designed trailing blades. Because the paper machine conversion would be very costly and time-consuming, the practicability of the concept had to be proved beforehand. The blades were therefore initially designed for long-term trials at VESTRA. After several optimisations, four full-scale blade units could be ordered. Their use in the paper machine was so successful that the customer is thinking about testing further innovative solutions at VESTRA. ■

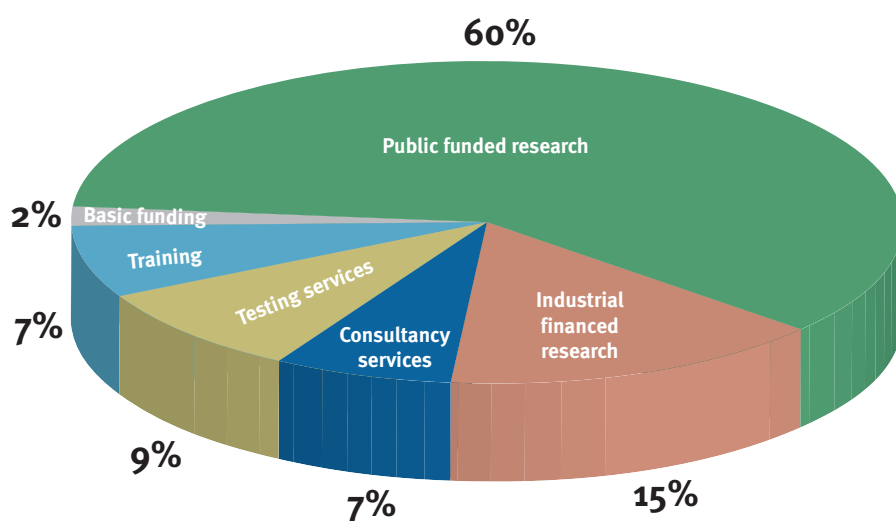
# ANNUAL FINANCIAL STATEMENT AS OF DECEMBER 31, 2010

<b>ASSETS</b>	T€
<b>A. Fixed assets and investments</b>	<b>13,116</b>
<b>I. Intangible assets</b>	<b>46</b>
<b>II. Tangible assets</b>	<b>13,016</b>
<b>III. Investments</b>	<b>54</b>
<b>B. Current assets</b>	<b>4,404</b>
<b>I. Inventories</b>	<b>569</b>
<b>II. Receivables and other current assets</b>	<b>815</b>
1. Trade receivables	355
2. Other assets	460
<b>III. Cash and bank</b>	<b>3,020</b>
<b>C. Prepaid expenses</b>	<b>0</b>
	<b>17,520</b>
<b>LIABILITIES</b>	T€
<b>A. Shareholder's equity</b>	<b>3,744</b>
<b>I. Assets of foundation</b>	<b>3,230</b>
<b>II. Reserves</b>	<b>514</b>
<b>B. Special reserves for investment grants to assets</b>	<b>7,904</b>
<b>C. Accruals</b>	<b>527</b>
<b>D. Liabilities</b>	<b>5,345</b>
1. Liabilities to banks	2,027
2. Prepayments received from customers	1,928
3. Trade payable	283
4. Other liabilities	1,107
<b>E. Deferred income</b>	<b>0</b>
	<b>17,520</b>

## PROFIT AND LOSS STATEMENT 2010

	T€
Sales revenues	12,868
Inventory changes	- 12
Other operational income	1,212
<b>Total income</b>	<b>14,068</b>
Material costs	- 716
Salaries and social expenses	- 8,801
Depreciation	- 2,016
Other operational costs	- 2,175
Taxes	- 122
<b>Operational result</b>	<b>238</b>
Financial result	- 189
<b>Surplus</b>	<b>49</b>

## FINANCING STRUCTURE 2010



**[www.ptspaper.de](http://www.ptspaper.de)**

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