

## Partners on Show - The Expertise Behind the Scenes

The development of novel polymer based solar thermal collectors is an ambitious aim which could not be accomplished without the longstanding expertise of the partners collaborating within SCOOP. A prolific mix of polymer specialists, collector manufacturers and researchers in the field ensure the quality of the work and will continue to pursue the envisaged aim for a better, inexpensive, sustainable and architecturally appealing use of solar thermal energy in the future.

The first newsletter sheds some light on the people behind the scenes of the SCOOP consortium, presenting the institutions and experts that will contribute to changing the future of solar thermal energy.

## News & Events

SCOOP started on December 1st, 2011 with a duration of 3,5 years. The first experts meeting was held in conjunction with the associated IEA SHC Task 39 meeting and workshop in Berlin on **May 14<sup>th</sup>, 2012**.

The next meeting will take place in Linz, Austria, on **October 11<sup>th</sup> + 12<sup>th</sup>, 2012**.

More information: [www.eu-scoop.org](http://www.eu-scoop.org)

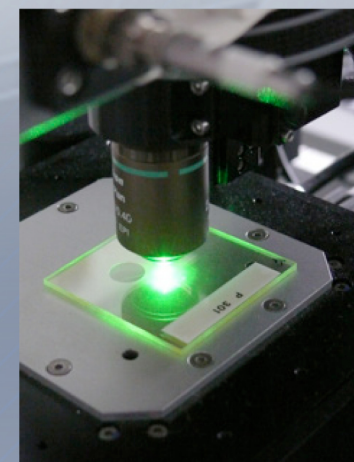


## The Fraunhofer Institute for Solar Energy Systems ISE

ISE is Europe's largest R&D institute devoted to solar energy and coordinator of the project SCOOP. It was established in 1981 and currently has a staff of more than one-thousand and an annual turnover of about €60 million. It is certified according to DIN EN ISO 9001: 2000. Fraunhofer ISE conducts research in the areas of thermal use of solar energy; photovoltaics; renewable electrical power supplies; chemical energy conversion; solar buildings; energy storage and the rational use of energy. Fraunhofer-ISE's department Weathering and Reliability is concerned with durability testing of solar systems and its components. Next to weathering (indoor and outdoor) of solar systems a strong focus is laid on the characterization of materials and non-destructive material characterization methods which is where the department's know-how for SCOOP comes in.

## Optimization of Novel Components and Materials – Durability Testing at Fraunhofer ISE

Within the project Fraunhofer ISE assumes a leading role in WP 5 “Qualification of new materials, absorbers and other components”, where Fraunhofer ISE develops and performs qualification tests of the materials and components developed in WP 3 & 4. Application specific non-destructive analytical tools will help to identify the material's characteristics and track the degradation processes.



*Raman Microscope at Fraunhofer ISE*

Fraunhofer ISE also leads WP 9 “Dissemination” as well as WP 10 “Management & Coordination”. It contributes to the collector and system design in WP 1 & 2 and supports WP 8 with collector testing know-how.

Project Coordination:

## Fraunhofer Institute for Solar Energy Systems ISE

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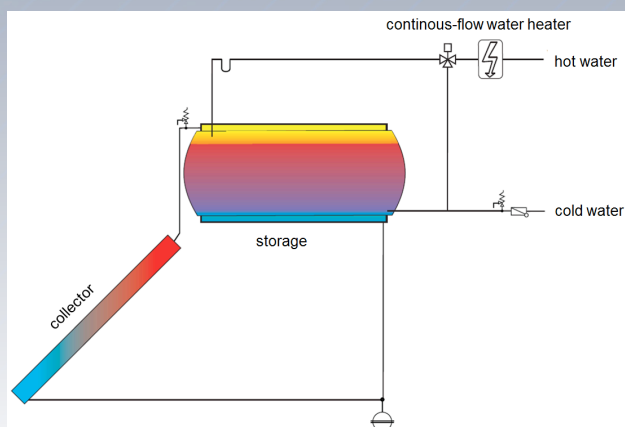


## AEE – Institute for Sustainable Technologies (AEE INTEC)

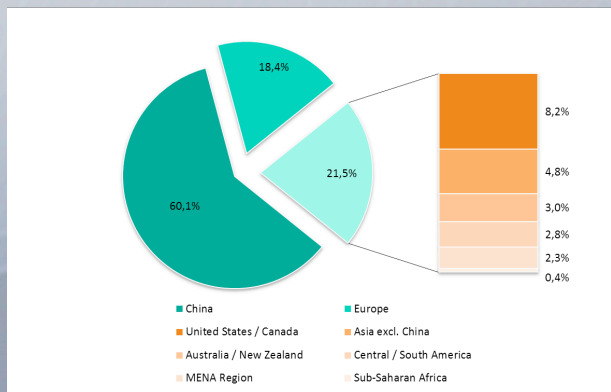
was founded in 1988 as an independent research association and is now one of the leading institutes for applied research in the fields of solar thermal energy, low-energy and zero energy buildings as well as in energy efficiency in industry. Besides these energy related topics also sustainable water management is a focus area.

## Design of Solar Thermal Components and Systems

Within the project SCOOP AEE INTECs' know how contributes to work package one: Market, costs & scale effects mainly on the global solar thermal market. And as the leader of work package two: The design of solar thermal collectors and systems AEE INTEC has lots of experience and research know how in the field of solar thermal components and systems.



Thermosiphon system



Share of the total installed capacity in operation by economic regions at the end of 2010

## AEE – Institute for Sustainable Technologies

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INSTITUT FÜR  
SOLARTECHNIK

The Institut für Solartechnik SPF with its staff of about 30 people is part of the University for Applied Sciences Rapperswil (HSR), Switzerland. SPF focuses on industry-oriented research & development (R&D) with a specialisation in the field of solar thermal energy. The scientists at SPF can draw upon 30 years of experience with regards to testing, research and development of materials, components, collectors and systems in the field of low and medium temperature solar thermal energy.

Optical characterisation of opaque and transparent materials used in solar applications is one of the basic tasks since the early eighties. Wide experience as well as high-quality equipment guarantees the highly accurate results needed for performance analyses for lifetime estimation. Specifically, SPF has been active in numerous international projects (IEA Task 10, 27, MSTC and EU SOLABS) dealing with the life time assessment of solar thermal energy materials and components.

## Quality Assessment of New Materials and Components

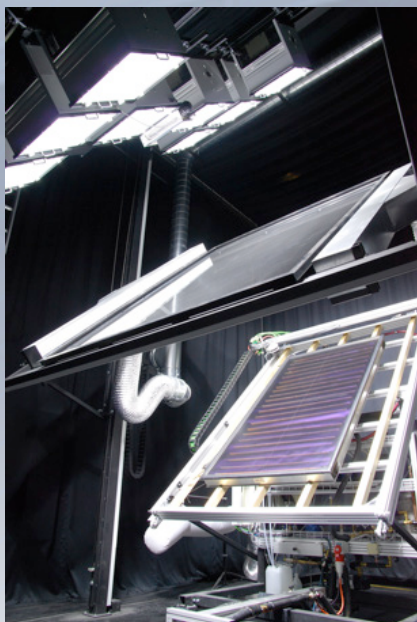
A unique broad range of instrumentation is available at SPF for testing performance and durability of components, collectors and systems. The SPF testing department is worldwide accredited for a broad range of solar collector and system test procedures. Up to now, more than 1000 collectors and more than 100 solar thermal systems have been tested. As a result



of these tests, SPF Testing has gathered a unique know how about possible problems and difficulties related with the selection of appropriate materials and designs. As a consequence of these insights SPF Testing has developed several specific test rigs to address particular problems and questions. Furthermore, SPF Testing offers different specific tests and certifications for collector materials and components such as connectors, insulations and absorbers.

Within the EU SCOOP project, SPF is working on the design of solar thermal collectors and systems

within WP2 and on the quality assessment of new materials and components in WP5. SPF is leading WP8 which is dealing with performance measurement and quality aspects of the newly developed collectors and systems.



*Solar simulator at SPF for collector testing*

**Institut für Solartechnik SPF:  
Hochschule für Technik Rapperswil HSR**

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HUMBOLDT-UNIVERSITÄT ZU BERLIN



## Humboldt-Universität zu Berlin

We have shown during the past three years that the degradation of polymers used as encapsulants in photovoltaic modules can be followed by fluorescence spectroscopy. The ageing time, the type of the stress factors and their combination strongly influences the shape and intensity of fluorescence. This is caused by different degradation products showing different fluorescence. These changes were imaged for whole commercially produced PV modules.

## Fluorescence as Non-Destructive Degradation Indicator of Polymers

Here we will expand our experience on the polymer materials used in photo-thermal systems. We will investigate the long-time (up to 2.000h) influence of UV irradiation, different temperatures and humidity on the stability of new polymer materials relevant for SCOOP. Using small pieces we will evaluate the correlation between the material changes and the kind and intensity of the different stress factors in a first step. These results will allow developing a basic scenario for more detailed study of the material.

Further we will investigate the influence of combined stress factors on indoor aged samples for comparison with the results obtained for outdoor aged prototypes. With this knowledge we will start to inspect outdoor aged absorber- or other polymer materials.



*Setup for fluorescence measurements on aged polymers*

## Humboldt-Universität zu Berlin

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## DS Smith Kayzersberg

**DS Smith Kayzersberg** is a world-class manufacturer of plastic sheet and finished plastic products. We have manufacturing sites in France, Spain and the UK.

We provide plastic to our customers in two main ways: either as sheets for resale or conversion, or as finished products. Both our sheets and finished products are sold under a variety of well-known brand names including Akylux® and Akyplac®, Akyver®, and Akysun®, a polypropylene based solar captor dedicated to the heating of swimming pools water. Our plastic products are made from polypropylene, polycarbonate or polyethylene.



## Extrusion of High Temperature Polymers

In SCOOP we deal with extrusion of absorber sheets in high temperature resistant polymer blends. In particular, Polyphenylene Sulfide (PPS) will be used. The PPS is well known in applications in harsh environments like for example automotive engine mounts or chemical pump parts. However, most of the PPS parts are obtained by an injection moulding process and extrusion of a twin wall sheet has never been done.



Extrusion process



Sheet profile

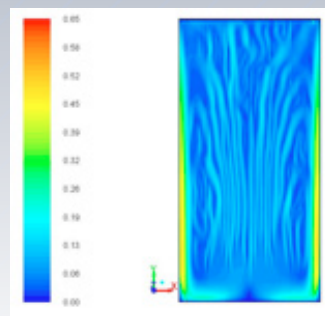
### Kaysersberg Plastics

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**Dr. Axel Müller – HTCO** is a leading consultancy company in the field of Computational Fluid Dynamics (CFD), specialized in fluid flow and heat transfer simulation. For 25 years HTCO has optimized and innovated products and developed sustainable and energy-efficient processes. Its profound physical expertise and process knowledge from various industrial projects and scientific research allows HTCO to provide a full-spectrum of CFD solutions to a wide range of industry sectors, including automotive, chemical and medical industries, microsystems, building industry, process technologies and power plants with currently increasing demands in renewable energies and heat exchangers.

## Innovative Collector Development by Flow Simulation

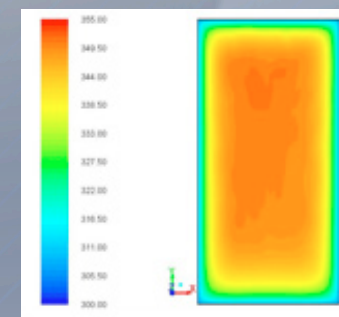


Velocity distribution

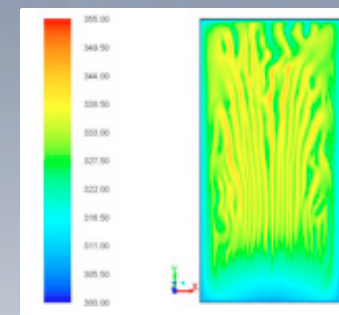
contribute to the project by developing and optimizing

Within the SCOOP project HTCO will mainly work on new and promising polymeric absorber, collector and system concepts (WP2). Since the application of polymeric materials in solar thermal systems offers radically new geometrical design possibilities, HTCO will

geometries by means of flow and thermal simulation that guarantee high component and system efficiency. The main goal is to achieve a homogeneous



Absorber temperature distribution



Air temperature distribution

flow distribution through the absorber by specific geometry of the end caps and a better heat transfer rate by adjusting the design of all system components. Other important issues are overheat protection and connection to the storage system. CFD will bring insights and understanding of the functionality of different designs. Calculating their theoretical performance in advance will help to choose the best systems to be built and tested.

### Dr. Axel Müller – HTCO

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## POLYTEC GROUP

**POLYTEC PLASTICS Ebensee/PPE** currently employs 160 members of staff, operates 20 injection moulding machines and carries out textile manufactures recording sales of EUR 27 million.

With the manufacturing processes used, 1-component injection moulding, 2-component injection moulding, gas injection moulding, sandwich injection moulding and film back injection moulding, a wide range of customer requirements can be fulfilled on the 20 machines with a press force of between 140 tons and 1,800 tons with shot weights of between 300 g and 16,400 g.

In addition to technical production know-how, POLYTEC PLASTICS Ebensee also offers support over the entire supply chain – for instance, if required for mail order selling, the entire logistics process through to the end customer, including returns processing, can be undertaken. 40 truck loading ramps and a rail connection incorporated in the warehouses are provided for this purpose. To ensure compliance with the necessary quality criteria, the site has been certified in accordance with ISO 9001 since 2002. To satisfy the stringent requirements of the automotive industry, the certification audits for ISO/TS 16949 and ISO 14001 were successfully passed after a short and intensive preparation period and thus the last step to become a tier 1 supplier was completed. In the leisure furniture segment, additional audits in accordance with DIN EN 581- 2 and - 3, British Standard 581-2 were completed. In the laboratory, the prevalent material and colour tests were undertaken and a FaroArm was recently acquired for measuring parts.

### Progress Through Injection Moulding

At the Scoop-Project the part of PPE is the check the established designs of the components with regard to processability at injection moulding and to realize first samples out of moulds with defined thermoplastic materials.



*Polytec product spectrum*



*The Ebensee plant at the heart of the Salzkammergut in Upper Austria*

### POLYTEC GROUP

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## aventa solar

**Aventa AS** is a private-owned SME research and industrial company established in 2005. The company is strongly engaged in research and development of solar collectors in polymer materials and electronic products for temperature control and energy metering. Aventa collaborates with industrial partners on polymeric materials, processing and solar collector development.

A main target of Aventa is to offer effective and architectural appealing solutions where solar collectors are integrated in the main structure of the building, which motivates a close collaboration with leading building industries, presently limited to Norway.

Experts in the company have done pioneering work on the use of polymers in solar collectors, and the company is a participant in IEA-SHC Task 39. The head office is located in Oslo, and the production facility for solar collectors is located in the industrial cluster of Norsk Hydro ASA in Holmestrand, Norway.

### Novel Designs and Building Integration

In the research project SCOOP Aventa focuses together with the R&D partners on building integrated, polymeric solar collectors and new concepts for emerging markets. Aventa is leading two Work packages: „WP6-Usability and building integration of systems of polymer materials“ and „WP7-Demonstration of solar systems with polymer collectors“.





Source: Peter Bernhard, Asplan Viak AS

## Aventa AS

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UiO : Universitetet i Oslo

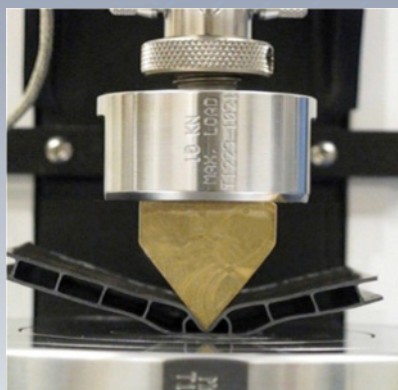


The Energy Research Group (ERG) is part of Department of Physics at the Faculty of Mathematics and Natural Sciences, University of Oslo (UiO). UiO's activity within solar energy research has been going since 1980. The ERG has worked on energy topics related to renewable energy, in particular solar energy, energy conversion, hydrogen as energy carrier and generally on energy saving at the end user level. ERG started already 25 years ago to investigate the possibilities for using new materials, in particular polymeric materials in solar thermal collectors. The substitution of the conventional metal solar absorbers with absorbers in polymeric materials was suggested in 1995 and is recognized as a pioneering contributi-

on on a new technology for solar thermal application. ERG has collaborated with large industrial partners as General Electric Plastics and Mitsubishi Chemical Corporation. ERG and the Norwegian company Aventa AS are also major partners in the R&D project SILVER-Solar Energy in Living Environments supported by the Research Council of Norway.

## Lab-Scale Testing of Components and Prototypes

In the research project SCOOP, ERG is leading Work package 4 „Multifunctional polymeric compounds and components for extrusion of absorbers“ and is mainly involved in lab-scale testing on component and prototype level.



Indentation tests for service-life estimation of solar collector absorbers

## University of Oslo, Norway

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**Advanced Polymer Compounds (APC)** was founded 2002 in a start-up centre at the University of Leoben, Austria as an office for engineering services. After the successful development of thermoplastic formulations a compounding line was established in 2005.

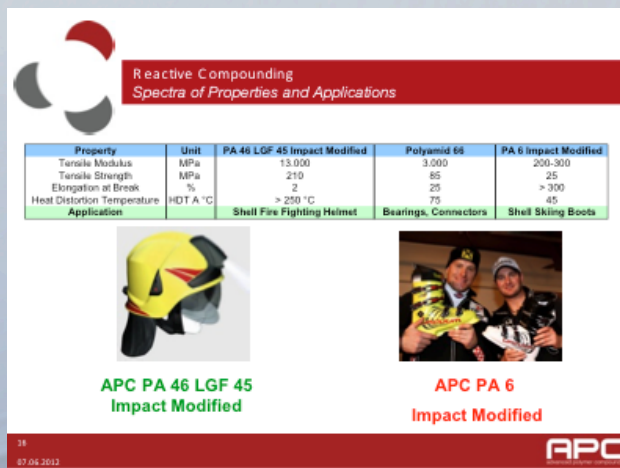
APC is specialized in research and development of thermoplastic formulations in order to find the appropriate polymer selection for the desired application. The core competence of APC is the reactive modification (impact modification, fibre reinforcement) of engineering plastics like polyamides or polyester in order to improve hydrolysis stability and to gain a balanced properties profile.

The picture below shows the range of the applications which can be processed with reactive modified polyamide-compounds – from an extremely soft and flexible shell of a skiing boot to the rigid and shock resistant fire fighting helmet.

## Reactive Modified Thermoplastics for Collector Components

In SCOOP APC will formulate and process compounds for injection moulded collector components based on the performance requirements developed in other work packages. Special attention will be given to long term properties and hydrolysis stability of the selected engineering thermoplastics.





**Reactive Compounding**  
Spectra of Properties and Applications

Property	Unit	PA 46 LGF 45 Impact Modified	Polyamid 66	PA 6 Impact Modified
Tensile Modulus	MPa	13.000	3.000	200-300
Tensile Strength	MPa	210	85	25
Elongation at Break	%	2	25	> 300
Heat Distortion Temperature	HDT A °C	> 250 °C	75	45
Application		Shell Fire Fighting Helmet	Bearings, Connectors	Shell Skiing Boots

**APC PA 46 LGF 45 Impact Modified**

**APC PA 6 Impact Modified**

APC

Reactive Compounding

## Advanced Polymer Compounds

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**JKU ipmt** Institute of  
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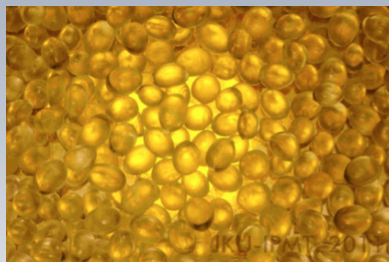
JOHANNES KEPLER  
UNIVERSITY LINZ

The Institute of Polymeric Materials and Testing at the **Johannes Kepler University Linz (JKU-IPMT)** was established in 09/2009. A major research area of the Institute is on the importance and perspectives of polymeric materials for sustainable development, in particular in the field of solar energy applications.

A special focus in nearly all of the research activities is on structure-property-processing-performance ( $sp^3$ ) relationships covering all size-levels from molecular-to-nano-to-micro-to-macro scales and accounting for the increasingly multi-functional performance requirements. JKU-IPMT initiated and established multi-partner consortium projects ([www.solpol.at](http://www.solpol.at)) dealing with various topics related to polymeric materials for solar energy technologies.

## Polymeric Materials and Injection Moulded Components

Within SCOOP specific research focus is given on polymeric materials and injection molded components for integrated collector systems and the aging behavior under service relevant conditions. Work package 3 of SCOOP is headed by Prof. Gernot M. Wallner, who is Deputy Head at JKU-IPMT and a leading member in several solar related working groups and committees (e.g., Subtask Leader within IEA SHC Task39).



## Institute of Polymeric Materials and Testing

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**GREENoneTEC** 1  
SOLAR COLLECTORS

**GREENoneTEC Solarindustrie GmbH**, founded in 1994, is the world's leading manufacturer of high-quality solar thermal collectors and related mounting systems. GOT collectors are based on defined technology platforms that are produced at a coordinated industrialisation rate. From robotised production systems with a high level of automation to custom-made, project-specific collectors: all our products are manufactured in line with industry quality standards. Besides the competence in production technologies GOT also has excellence in development of solar systems, which has been worked out through several national and international R&D projects together with different research institutions within the last 10 years.

## Market, costs & scale effects

In SCOOP, GOT is the leader of the work package 1 "Market, costs & scale effects" and will work in WP2 and WP3, which are dealing with the designing and prototyping of solar thermal collectors and systems (like thermo-siphon systems and integrated storage collectors) based on polymeric materials.

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