Smart Cities conference

Fraunhofer Institute for Wood Research
Wilhelm-Klauditz-Institut WKI
Fields of Activity

- Technology for Wood-based Panels
- Material Analysis and Indoor Chemistry
- Surface Technology
- Structural Engineering and Construction
- Quality Assessment
- Wood Fiber Research
General Figures

- Affiliation: The Fraunhofer-Gesellschaft
- Staff: 109 (160)
- Research officers: 53
- Budget: 11.4 Mio. € (2014)
- Investments: 780,000 € (2012), 1,1 Mio € (2014)
- Funded support: International Association for Technical Issues related to Wood (registered association) (iVTH)
## Equipment

<table>
<thead>
<tr>
<th>Useful areas</th>
<th>Description</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices, laboratories, infrastructure</td>
<td></td>
<td>ca. 4300 m²</td>
</tr>
<tr>
<td>Technical fields</td>
<td></td>
<td>2000 m²</td>
</tr>
<tr>
<td>Test fields for weathering test</td>
<td></td>
<td>400 m²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Library (2012)</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist books</td>
<td></td>
<td>10 800</td>
</tr>
<tr>
<td>Trade journals (subscription)</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Loose-leaf collection</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>
Special Equipment (1)

- Process-engineering test fields
- Climatic exposure test cabinets, test facility
- Test chambers for the detection of the emission behaviour under indoor conditions
- Online mass spectroscopy
- Thermal analysis
- Facilities for natural and time-lapse weathering of surfaces
- Test houses for examination of building elements
- Thermographic camera for detection of delaminations
- Indoor/outdoor climate simulator for examination of building elements
Special Equipment (2)

- Drying systems on a semi-technical scale
- Laboratory-scale plant for manufacture of OSB with roller conveyor to the hot press and programmable press control
- Small-scale plant for production and gluing of fibers
- Devices for non-destructive examination
- Acoustical testing device for laminated floorings
- Extrusion plant for WPC (Wood-Plastic-Composites) manufacture
- Performance test device for floors and roofs
Technology for Wood-based Materials
Prof. Dr.-Ing. Volker Thole
Technology of Wood-based Materials

Fields of activity

- Material research and development
- Optimization of the properties of materials made from wood and other regenerative raw materials, and of organic and inorganic binders
- Raw material and materials testing
- Utilization of secondary raw materials and of residues
- Preparation of fibres for composites and paper
- Structure orientated wood-based materials, splinter and fibre materials, plywood
- Questions of ecology
Technology of Wood-based Materials

Selected projects

- Structured materials made from wood particles
- Dry gluing as alternative to the blow-line gluing in MDF manufacture
- Low emission drying of wood particles in a closed-loop dryer
- Binder systems made from vegetable oil derivates for application in wood-based materials and fibre moulds
- Utilization of residues from palm oil cultivation to produce fibre boards in Malaysia
# Surface Technology

## Fields of activity

- Acrylate dispersions
- Adhesives
- Application processes
- Certification products
- Coating recycling
- Coating testing
- Damage analysis
- Exterior testing

- Oleo chemistry
- Polyesters
- Polymer analytics
- PU-dispersions
- Radiation curing lacquers
- Saccharide chemistry
- Wood protection
Surface Technology

Selected projects

- Extended concepts of coating recycling using online measurement and preparation methods
- Development of a simplified method for the testing of the suitability of MDF for exterior door applications
- High quality products for the paint and plastics industry from by-products of the biodiesel production through biotechnological processes
- Robot-assisted coating of windows and wooden building elements for resource saving and optimised surfaces
- Saccharide containing, water-based binders for wood coatings as a substitute for methyl methacrylates containing dispersions
- Virtual product qualification for the sustainability
Material Analysis and Indoor Chemistry
Prof. Dr. Tunga Salthammer
Material Analysis and Indoor Chemistry

Fields of activity

- Indoor air quality measurements
- Chamber emission tests
- Material analysis
- Standard test procedures
- Characterization of nano-particles
- Biocide analytics
Material Analysis and Indoor Chemistry

Selected projects

- VOC and particle emissions from electronic devices
- Release of formaldehyde from insulation material
- Photo-catalytic systems for the reduction of VOC in rooms
- Pollutants in museums and archives
- Indoor air quality in residential and office buildings made of wood or wood-based material
- Gas-phase/particle partitioning of SVOC in the indoor environment
- New methods for the analysis of volatile aldehydes
- Breath gas analysis
Material Analysis and Indoor Chemistry

Special equipment

- Gas chromatography / mass spectrometry (GC/MS)
- Proton transfer reaction mass spectrometry (PTR-MS)
- Elemental analysis by ICP-OES and XRF
- HPLC
- Online formaldehyde analysis
- Photo-acoustic detection
- Analysis of trace gases
Structural Engineering and Construction
Dipl.-Ing. Harald Schwab (acting)
Structural Engineering and Construction

Fields of activity

- Building-physical investigations
- Mechanical investigations
- Fire research
- Expert surveys
- External supervision
- Approvals
Structural Engineering and Construction

Selected projects (1)

- Weathering simulation
- Numerical simulation
- Climate analysis
- Load-carrying capacity of wooden building components, p. ex. timber frame walls
- Corrosion Impact on junction elements (joints)
- Development of reactive coating systems
- Development of new products with enhanced fire performance properties
Structural Engineering and Construction

Selected projects (2)

- External supervision
- Quality and performance supervision for various build-legal and private quality communities
- Approval tests, p. ex. for heat insulating materials and external thermal insulation composite systems in timber constructions
- Book: Research on framework – Contributions for its conservation
Structural Engineering and Construction

Equipment

- Thermogravimetric analysis coupled with Fourier-transform-Infrared Spectroscopy / Mass Spectrometry (TGA-FTIR / MS)
- Thermomechanical Analysis (TMA)
- Differential Scanning Calorimetry (DSC)
- High-Pressure DSC-Microscopy System
- Dynamic Stress Rheometer (DSR)
- Texture Analyser
Quality Assessment

Dipl.-Ing. Harald Schwab
Quality Assessment

Fields of activity

- Testing laboratory for wood and wood based panels
- Inspection body for quality assurance systems in the wood based panels industry
- Certification body for quality assurance systems in the wood based panels industry
- Development of new test methods for wood based panels
- Research and development in the area of adhesives for the building industry
- Contribution in committees for the development of engineering standards in the area of wood based panels
Quality Assessment

Selected projects (1)

- Inline measurement methods for the determination of formaldehyde emissions in the production of wood based panels
- The production process of wood based panels and the formaldehyde emission of the produces panels
- Certification systems and eco labels in the area of emission of wood based panels in Europe
Quality Assessment

Selected projects (2)

- High-speed methods for the determination of the moisture content in wood and wood based panels
- Modern adhesives for timber constructions and the bonding of wood and other materials
The »Internationaler Verein für Technische Holzfragen e. V.«

- Enhances wood research
- Establishes contacts between science and practice
- Links economy and ecology
- Reports on the state of the art
- Is a member in the »Arbeitsgemeinschaft industrieller Forschungsvereinigungen« (AiF) (Working pool of industrial research groups)
- Answers your questions
The Fraunhofer-Gesellschaft

- **Research and development**
  - Application-oriented research of direct use to businesses and for the benefit to society
  - Application-oriented basic research
  - Departmental research for the German Federal Ministry of Defense

- **Business community**
  - Institutes work as profit centers
  - One-third of the budget consists of income from industrial projects
  - Spinoffs by Fraunhofer researchers are encouraged

- **Contracting partners/clients**
  - Industrial and service companies
  - Public sector
Fraunhofer is the largest organization for applied research in Europe

- 66 Fraunhofer institutes and independent research units
- More than 22,000 employees, the majority educated in the natural sciences or engineering
- An annual research volume of 1.9 billion euros, of which 1.66 billion euros is generated through contract research.
  - 2/3 of this research revenue derives from contracts with industry and from publicly financed research projects.
  - 1/3 is contributed by the German federal government and the Länder governments in the form of institutional financing.
- International collaboration through representative offices in Europe, the US, Asia and the Middle East
Joseph von Fraunhofer

Discovery of the “Fraunhofer lines” in the solar spectrum

New methods for processing lenses

Director and partner in a glassworks

Research and development on behalf of industry and state

mp3 music format, white LED, high-resolution thermal camera

Research volume: approx. 1.66 billion euros annually
Financial Structure of the Fraunhofer-Gesellschaft (million euros)

- Major infrastructure capital expenditure
- Defense research
- Contract research

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Major Infrastructure Capital Expenditure</th>
<th>Defense Research</th>
<th>Contract Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1401</td>
<td>1257</td>
<td>144</td>
<td>167</td>
</tr>
<tr>
<td>2009</td>
<td>1617</td>
<td>1473</td>
<td>144</td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>1657</td>
<td>1493</td>
<td>144</td>
<td>120</td>
</tr>
<tr>
<td>2011</td>
<td>1849</td>
<td>1537</td>
<td>144</td>
<td>168</td>
</tr>
<tr>
<td>2012</td>
<td>1926</td>
<td>1614</td>
<td>113</td>
<td>209</td>
</tr>
</tbody>
</table>
Contract research revenue (million euros)

- Other income
- European Commission
- Federal and Länder governments
- Industrial revenue
- Base funding
The Fraunhofer-Gesellschaft in a multi-dimensional field of tension

<table>
<thead>
<tr>
<th>On the one hand</th>
<th>On the other hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>66 Institutes with different “Institute cultures”</td>
<td>A single organization with a mission</td>
</tr>
<tr>
<td>Applied research as a profession</td>
<td>More than 250 business fields and core competencies</td>
</tr>
<tr>
<td>Excellent research</td>
<td>Strong applications orientation</td>
</tr>
<tr>
<td>Institutional and project funding</td>
<td>Revenues from contract research</td>
</tr>
<tr>
<td>Management/rules of a public institution</td>
<td>Entrepreneurial action</td>
</tr>
</tbody>
</table>
Structure of the Fraunhofer-Gesellschaft

60 Fraunhofer Institutes

7 Groups:
- Information and Communication Technology
- Life Sciences
- Microelectronics
- Light & Surfaces
- Production
- Materials and Components
- Defense and Security

Assembly of Members

Executive Board

Scientific and Technical Advisory Board

Senate

elects

appoints

discharges

Presidential Council

advises

advises

Advisory Boards
# Fraunhofer Alliances

<table>
<thead>
<tr>
<th>Adaptronics</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive Manufacturing</td>
<td>Food Chain Management</td>
</tr>
<tr>
<td>Advancer</td>
<td>Lightweight Structures</td>
</tr>
<tr>
<td>Ambient Assisted Living AAL</td>
<td>Nanotechnology</td>
</tr>
<tr>
<td>Automobile Production</td>
<td>Optic Surfaces</td>
</tr>
<tr>
<td>Building Innovation</td>
<td>Photocatalysis</td>
</tr>
<tr>
<td>Cleaning Technology</td>
<td>Polymer Surfaces POLO</td>
</tr>
<tr>
<td>Cloud Computing</td>
<td>Simulation</td>
</tr>
<tr>
<td>Digital Cinema</td>
<td>Traffic and Transportation</td>
</tr>
<tr>
<td>E-Government</td>
<td>Vision</td>
</tr>
<tr>
<td>Embedded Systems</td>
<td>Water Systems (SysWasser)</td>
</tr>
</tbody>
</table>
The Executive Board

Prof. Dr.-Ing. Reimund Neugebauer
President of the Fraunhofer-Gesellschaft

Dr. Alexander Kurz
Senior Vice President Personnel and Legal Affairs

Prof. (Univ. Stellenbosch) Dr. Alfred Gossner
Senior Vice President Finance, Controlling (incl. Business Administration, Purchasing and Real Estate), Information Technology
Fraunhofer-Gesellschaft Human Resources
2008 - 2012

- Apprentices
- Graduands and students (tertiary and secondary)
- Scientific, technical and administrative staff