fiatec
Filter & Aerosol Technologie GmbH

General (1)

- **Owners/Manager:** **Heinz Bittermann**
  Steffan Trnetschek
  Matthias Eber
- **Founded:** **October 20,1999**
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- **Location:** **Mainleus/Bavaria**
- **Employees:** **10**
- **Revenues 2014/15:** **1.100.000 EUR**

General (2)

Fiatec GmbH …

- … is a Spin Off of Fraunhofer‘s Institute for Toxicology and Aerosol Research
- … is Economically Independent
- … has State of the Art Equipment
- … is the Leading European Test Lab in Cabin Air Filtration

Persons and Competence (1)

- **Heinz Bittermann**
  - Masters Degree in Physics
  - 25 Years of Professional Filtration Experience in
    - R+D (Engineering and Testing)
    - Process Engineering (Manager of PE at helsa automotive)
    - Representative of Helsa at Wix-Helsa Filtration Technologies, Inc., NC
    - Chairman of the DIN-Standardization Working Group for Cabin Air Filtration
    - Member of Several Working Groups in ISO TC 142 and ISO TC 22

Persons and Competence (2)

- **Steffan Trnetschek**
  - Masters Degree in Chemical Process Engineering
  - 25 Years of Professional Filtration Experience in
    - Optimization of Activated Carbons (Impregnations and Treatment)
    - Filtration Industry Experience (helsa-automotive and Mann+Hummel)
    - Manager of Applications Engineering, R+D
    - Member of Several Working Groups in ISO TC 142 and ISO TC 22

Persons and Competence (3)

- **Matthias Eber**
  - Masters Degree in Process Engineering / Food Sciences
  - Scientific and Professional Experience in
    - Scientific work at Max Rubner Insitut of Germany
    - R+D experience
    - Fiatec General Manager since 2014
    - Member of Several Working Groups in ISO TC 142 and ISO TC 22

Markets and Market Shares (1)

- **Automotive (Cabin Air)**
  - 40 % of Revenues
  - Very Sound Market Position
- **General Ventilation (HVAC)**
  - 20 % of Revenues
  - Business Segment is Growing
- **Clean Room Application**
  - 5 % of Revenues

Markets and Market Shares (2)

- **Testing Facilities and Consulting**
  - 10 % of Revenues
- **Gas Turbines**
  - 20 % of Revenues
- **Others**
  - 5% of Revenues

Automotive

- **Reference Laboratory for**
  - Volkswagen / Audi
  - GM of Europe and World
  - PSA-Group
  - Renault
  - Daimler AG
  - BMW
  - and other OEM‘s
  - Many Filter and Filter Material Suppliers

Services – Testing

- **Filter Performance Testing**
  - Particulate
  - Gas Phase Filtration
  - Filters, Media and Raw Materials
  - Mechanical Tests
  - Ageing and Conditioning
  - Microbiological Tests
  - Portable Air Cleaning Devices
  - White Ware

Plus many other tests

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ISO Test Dust & Test Contaminant Products

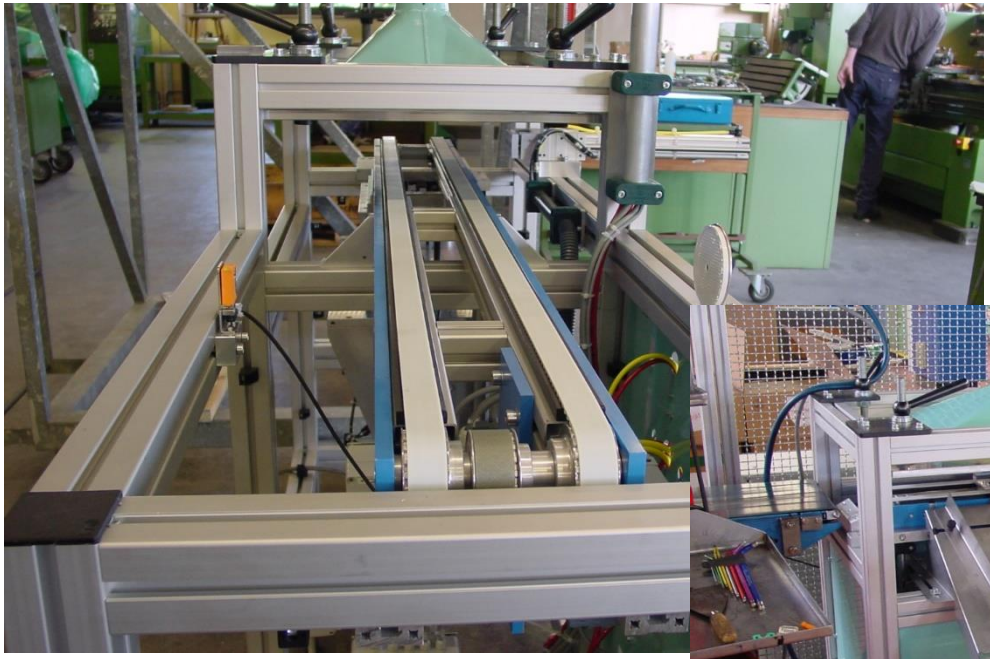
Powder Technology Inc. (PTI) is the leading manufacturer of ISO 12103-1 test dust grades as well as other contaminants used for testing. PTI and fiatec were instrumental in writing “ISO 12103-1 Road Vehicles – Test Dust for Filter Evaluation”, there are four grades of test dust designated under this specification.

During development of the latest version of ISO 12103-1 fiatec was asked to act as PTI´s European sales partner.

We now deliver the whole of Europe plus several other countries like Tunisia, Turkey, Egypt or Israel.

Test Bench Design – Pulse Jet Cleanable Filters – ARAMCO/ISO

Test Bench Design – References (in-line pressure drop test rig)



Test Bench Design – References (fully equipped particle test rig)

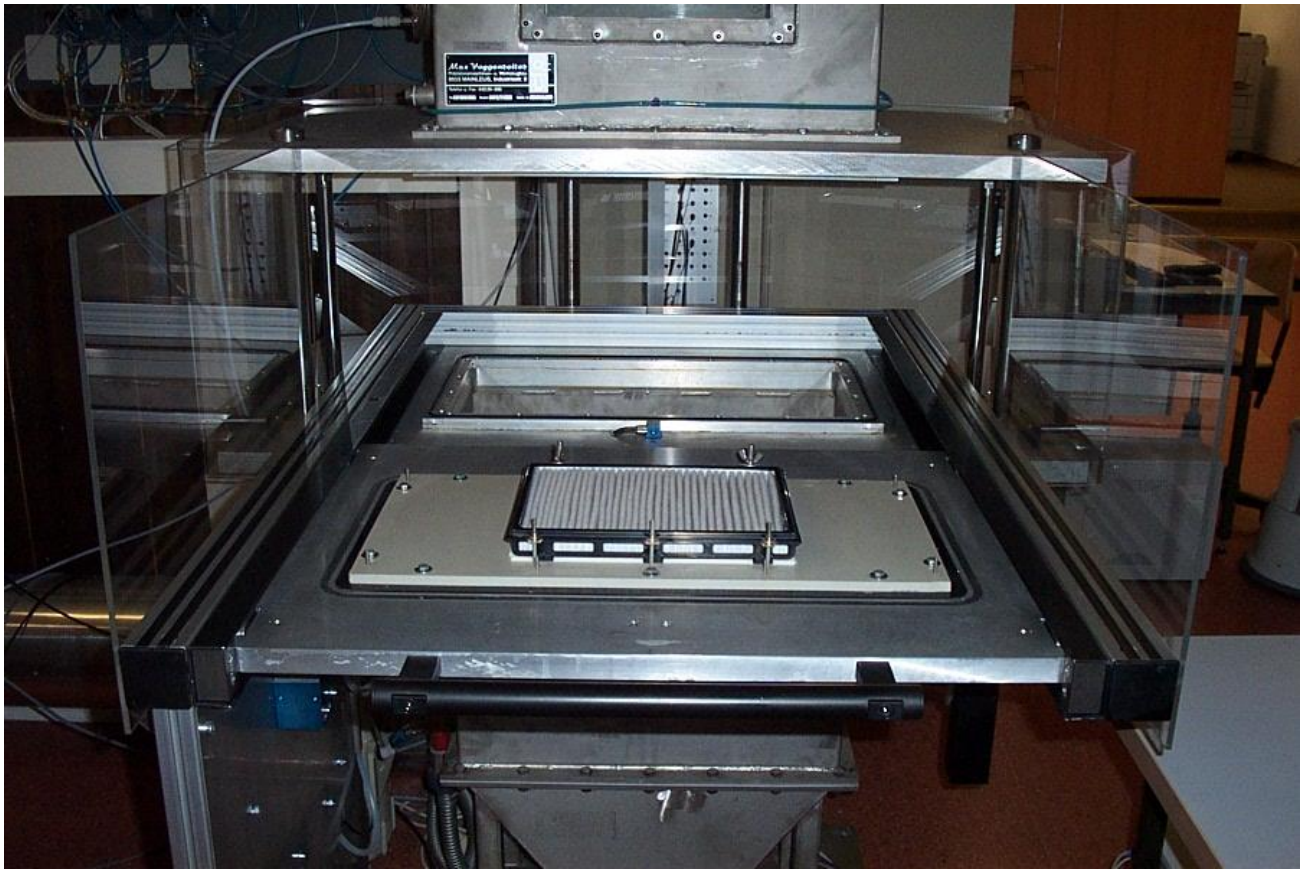
Test Bench Design – References (cabin air particle filter test bench)

During Construction

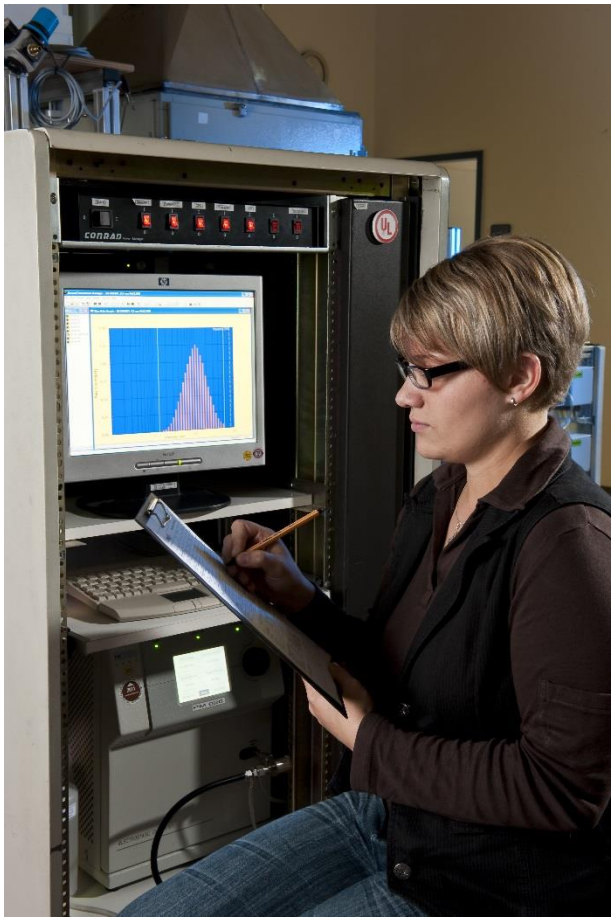
Shipping

During Installation And Setup

Test Bench Design – References (fiatec adsorption test bench - detail)



Test Instruments – Scanning Mobiliy Particle Spectrometer (TSI Inc.)



EN 1822 Test At fiatec

Using A Scanning Mobility Particle Sizer (SMPS) For Nano-Particles

Test Bench Design – References (fiatec EN779 test bench)

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Scope And Introduction**
  - Description Of The Real World Application
    - Environment Specific Problems (Fouling, Corrosion Etc.)
    - Salt Water Concentration
    - Concentration And Size Of Droplets In Air (Relevance Of NGTE 30 Knots)

µm	Salt Content, ppm
<2	0.0038
2-4	0.0212
4-6	0.1404
6-8	0.3060
8-10	0.4320
10-13	0.6480
>13	2.0486
Total	3.600

    - Dry Or Wet Salt?
    - Other Phenomena (Horizontal Rain, Snow, Insects)

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Work Done Earlier And Available Data Base**
- **Definition Of The Lab Test Targets**
  - Standard Tests According To EN779 Or ASHRAE 52.2
  - Test Requirements Specific To Offshore And Marine Applications
    - Extreme Humidity Conditions And The Presence of Salt
    - Is Re-entrainment An Issue?
    - What Is The Actual Particle Size Distribution On A Platform Or A Marine Vessel

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Proposed Test Procedures**
  - Test Rig Requirements And Recommendation
    - Use Existing Test Bench, Either EN779 Or ARAMCO-Type
    - Consider Airflow Capabilities And Control Of Humidity
    - Avoid Specific Test Bench Design
  - Test Conditions: Temperature And Humidity
    - Easier In The ARAMCO Rig
  - Pressures (Differential And Static)
    - Standard In Most Benches, No Need For Further Discussion

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Aerosol Generation**
  - Rotary Atomizer
  - Laskin Nozzles
  - Dry Salt And Feeders (Auger Type Etc.)

  - Others

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Aerosol Detection And Concentration Measurement**
  - Sodium Flame Photometers
    - Advantages and Disadvantages
  - Stage Impactors
    - Advantages and Disadvantages

  - Particle Counting Methods (preferred)
    - OPC, APS, SMPS

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Recommendation Summary**
  - Open Questions
    - Is it reasonable to define a “one-covers-all” test regarding the procedure, the aerosol and the conditions?
    - On what application do we put our focus?
    - Are there any further known special application-related problems which should be considered here?
  - Test Procedure Proposal
    - Efficiency of filters against saline solutions
    - Particle Shedding or Re-entrainment under high humidity conditions
    - Loading/Clogging under very humid (offshore) conditions
    - Filter Fouling and Integrity

Salt Water Test Procedure for Gas Turbine Air Inlet Filtration in Offshore Environments

- **Preferable Instrumentation**
  - ARAMCO-Type Test Rig
  - Aerosol Generation: Laskin Generator Or Rotary Atomiser
  - Concentration And Efficiency Measurement:
    - Particle Counting Method (Device Depends On The Particle Size To Be Observed And The Filter Grade)
    - Sampling Methods (Ionchromatography, Gravimetry etc.)

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THANK YOU FOR YOUR ATTENTION