

OekoSolve AG

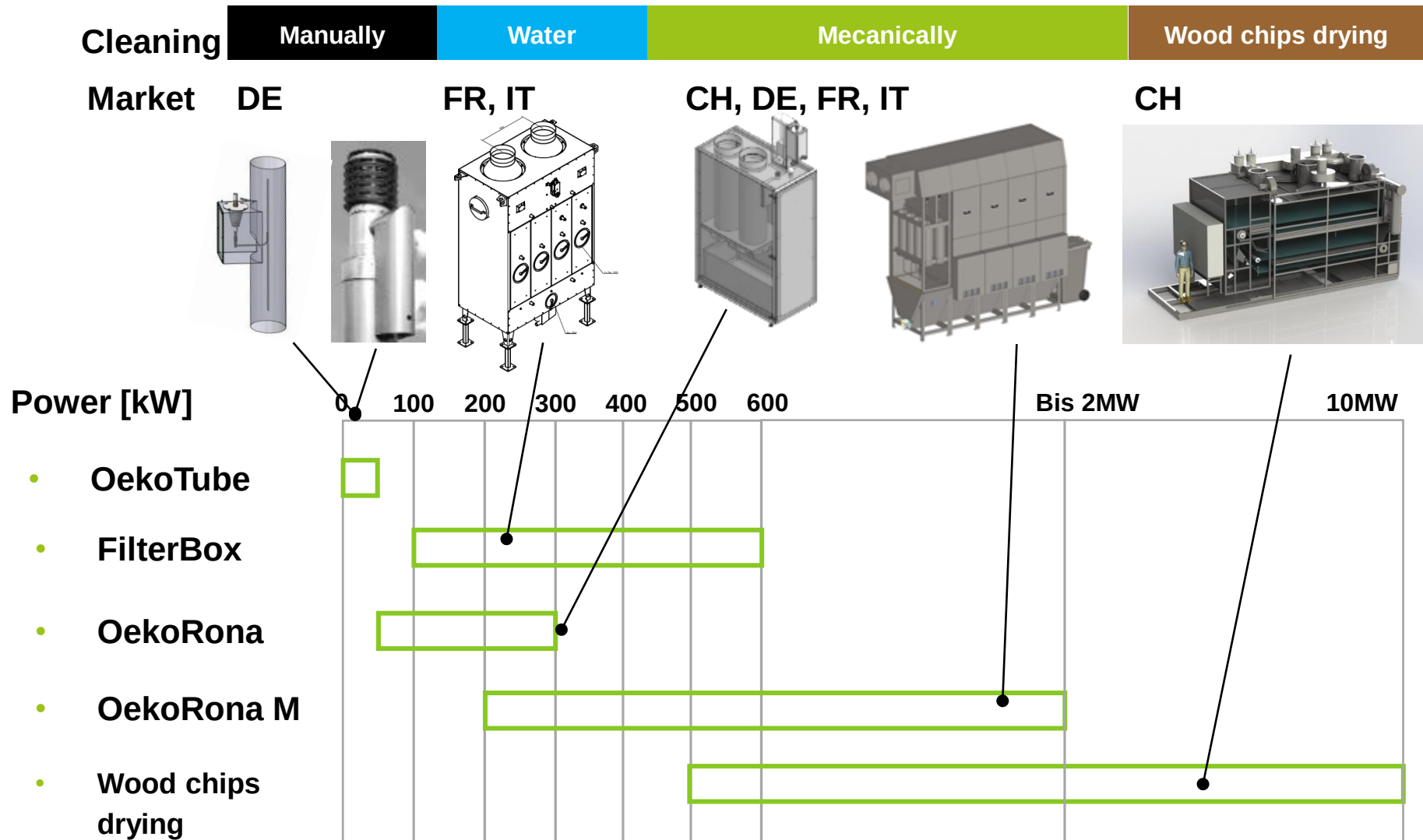


OekoSolve AG

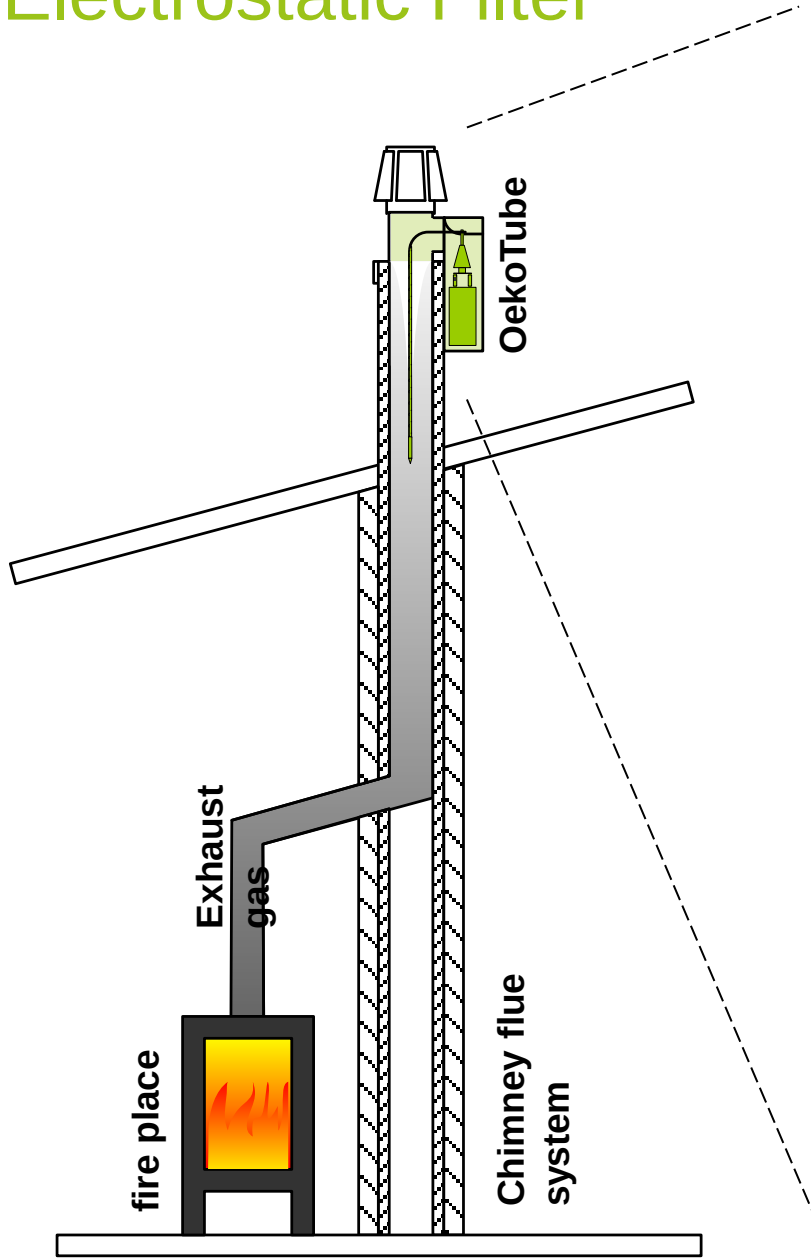
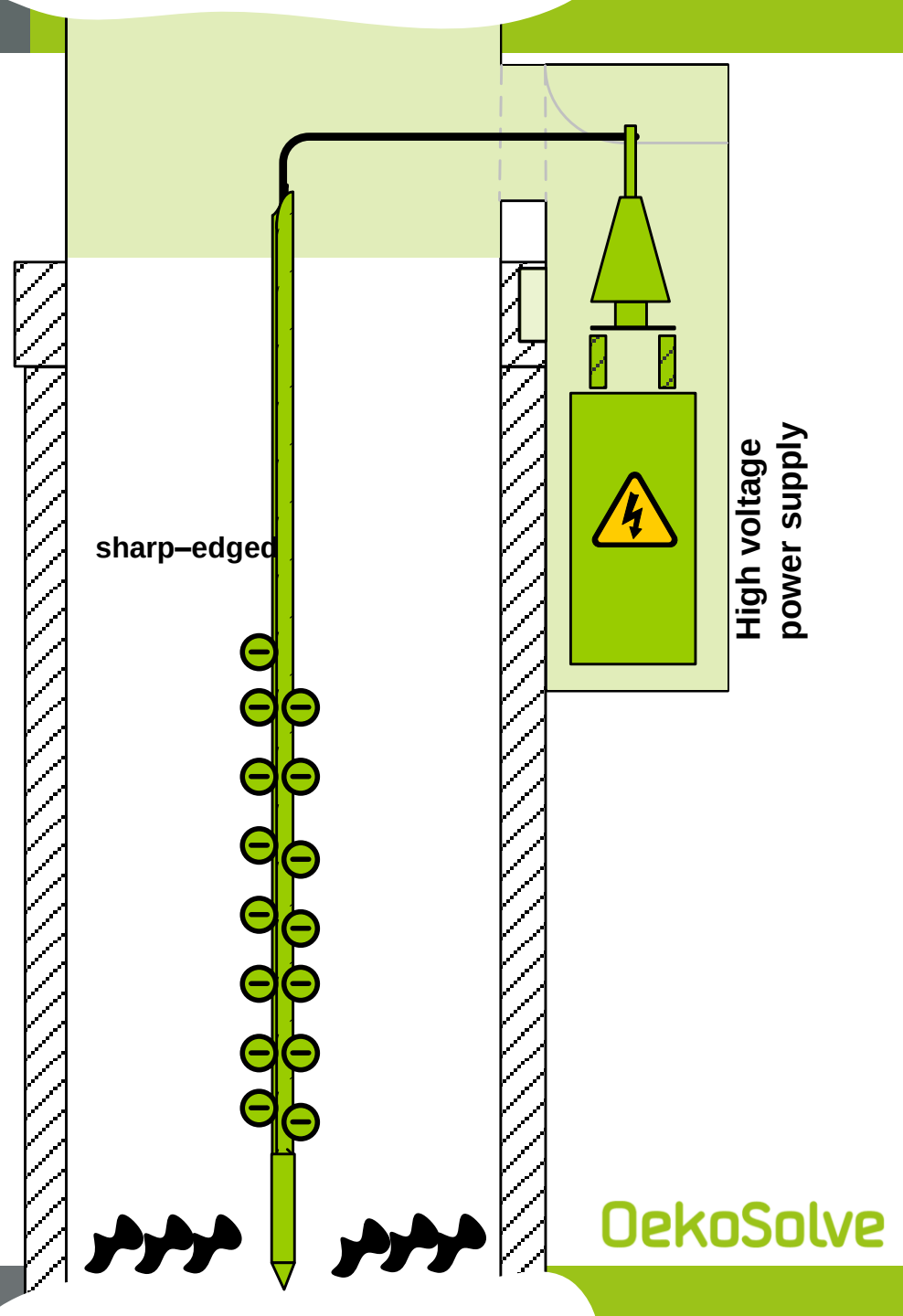
- 2006-2007
 - Idea of the OekoTube
 - Established OekoSolve
- 2008-2009
 - Selling of precipitators until 40kW
- 2010-2011
 - Selling of precipitators until 300kW (wet cleaning)
- 2012-2013
 - Move to Plons, Mels
- 2014
 - Selling of precipitators until 500kW (Dry cleaning)
- 2015-2016
 - Selling of precipitators until 2 MW
 - Construction of new office and production building
- 2017
 - Selling Wood chip drying with integrated electrostatic precipitator
- 2019
 - 30 employees including 4 apprentices



Portfolio Precipitators OekoSolve 2020



Electrostatic Filter



Electrostatic precipitator (ESP)

- Advantages ESP
 - High efficiency for micro-dust (even smaller than $1\ \mu\text{m}$)
 - Very low effect on draught and pressure drop
 - Low operating and maintenance costs
- Drawback ESP
 - Flocculation possible
 - Interruption by short circuits

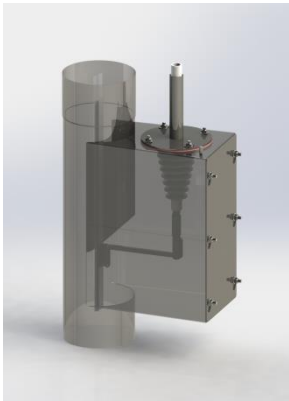
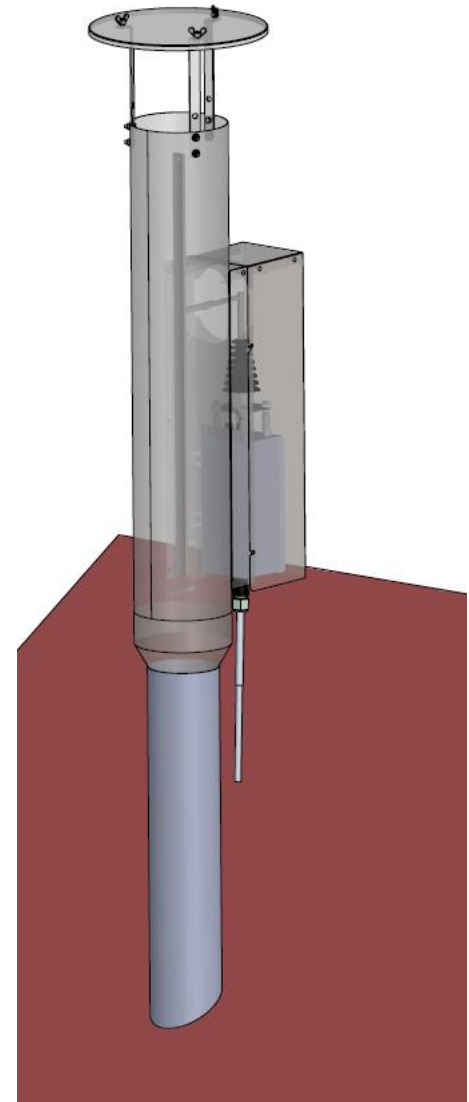


OekoTube

- Automatic operation
- Cleaning by the chimney-sweeper
- Authorized in CH, GER, IT, LI, FR, NZ

Without loosening screws

Without dismantle the electrode



OekoSolve

Simple and easy fitting - suits all types of chimneys



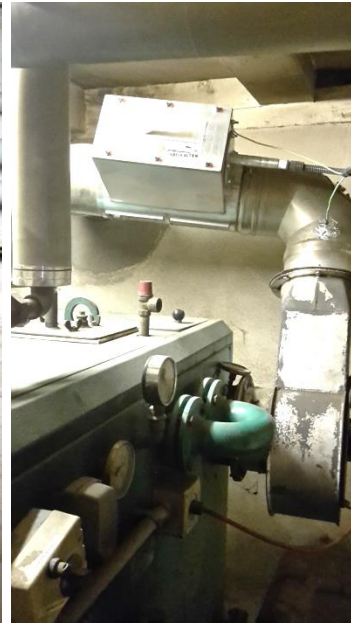
OekoTube-Inside: Sample installation



Atmos, wood chips
18 kW



Viessmann, Pellet
24 kW



Zima, wood chips
50 kW



Hoval, wood logs
25 kW

OekoTube-Inside: Installation in the attic



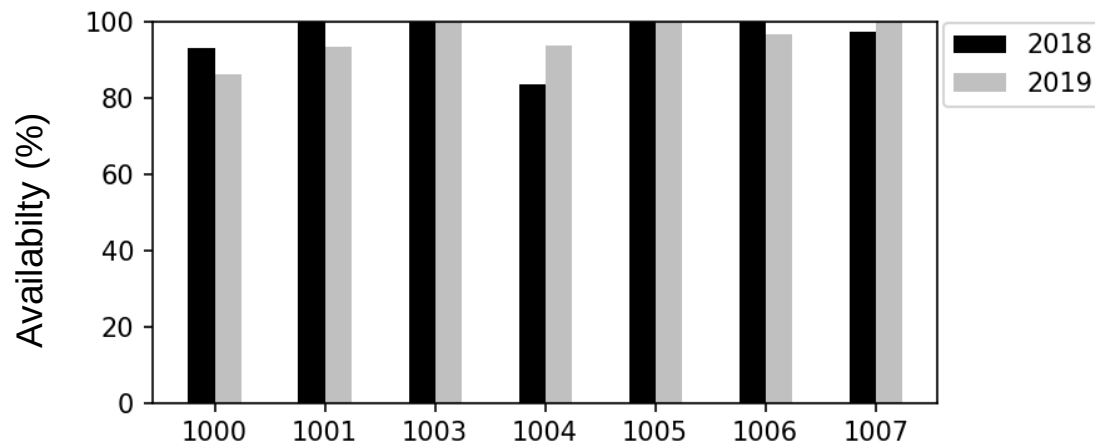
Cleaning

- Periodic cleaning, depending on fire place and hours working
 - Estimation made by chimney sweeper after the initial operation
- Simple cleaning from the bottom (don't use a metal broom)
 - The electrode avoids the broom



Maintenance

- Maintenance every 2 to 4 years: Clean horizontal pipe, insulator
- Future: Cloud for observation of availability



OekoTube: Degree of separation

- Misox, CH:
 - Two heating periods (2017/18 and 2018/19) accompanied by Verenum
 - 7 units mounted and 5 units measured
 - Separation: Ø 74 %
 - Availability 84 – 100%

	storage heater (Speicher-ofen)	Fireplace (Cheminée, Kamin)	Cooker (Zentral-heizungs-herd)	pellet stove (Pelletofen)	storage heater (Speicher-ofen)
ESP ON (mg/m3)	21	29	37	4	39
ESP OFF (mg/m3)	147	131	111	26	98
Separation	86%	78%	66%	83%	60%
Separation (mg/m3)	126	102	74	22	59

OekoTube: Degree of separation

Graz, AT:

- 4 test installations, accompanied by Bios, Graz (2014-2016)
- Separation: Total dust emission: 54 – 90 %, Micro-dust: 46 – 98%
- Availability 92 - 98%

Saas-Fee, CH:

- 74 units installed 2009-2011
- 22 units measured in 2018/2019, accompanied by FHNW
- Separation: Ø 70 %

	User 1	User 2	User 3
Raw gas (mg/m3)	50	100	150
Pure gas (mg/m3)	15	30	45
Separation	70%	70%	70%
Separation (mg/m3)	35	70	105



OekoSolve – Micro-dust filters
and heat exchange recovery

Thank you for your attention

Schmelziweg 2
CH-8889 Plons
www.oekosolve.ch

OekoSolve

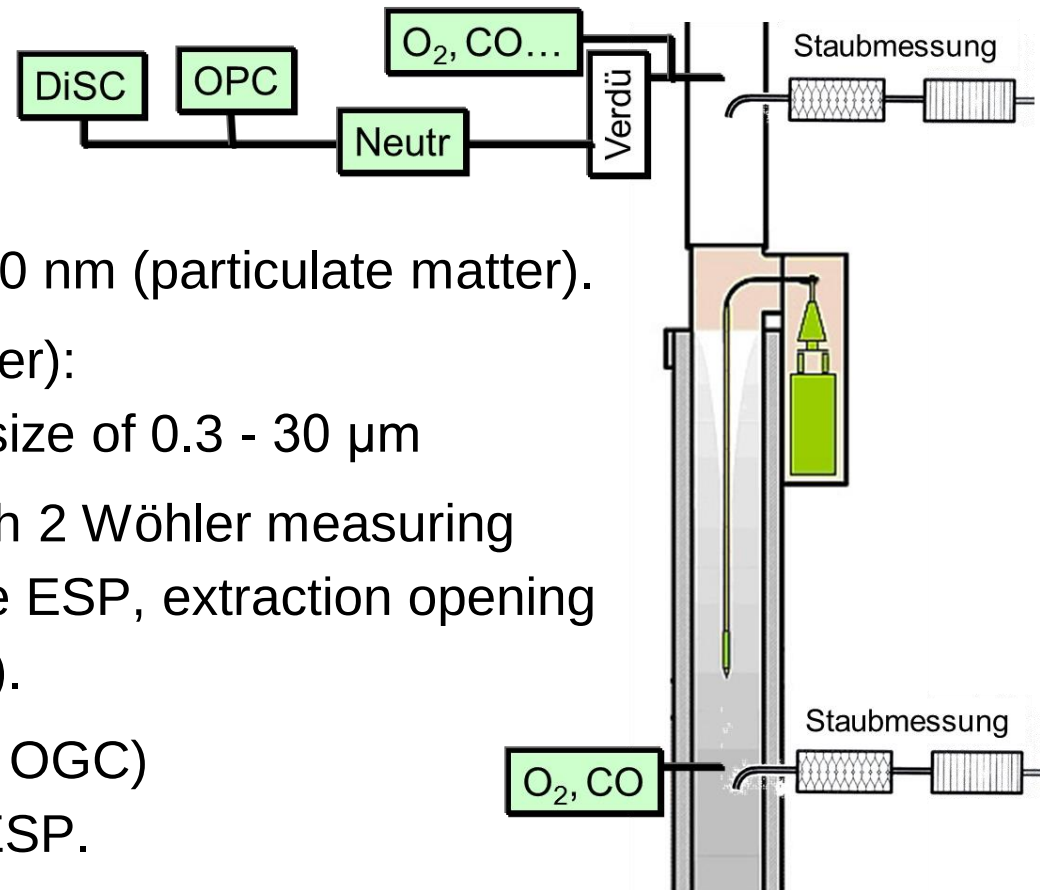
OekoSolve AG

- competences
 - High voltage (development and production)
 - Insulator (development and production)
 - Electronics & Control Box (development and production)
 - Software (development)
 - Plant construction in CAD
 - Mechanical production and assembling of precipitators
 - In-house measuring technology and analysis of fine dust
 - Test stand with different fires
 - Cooperation with various national and international universities and research institutes
 - Reliable and well-trained service team across Europe
- Its own production makes the development fast

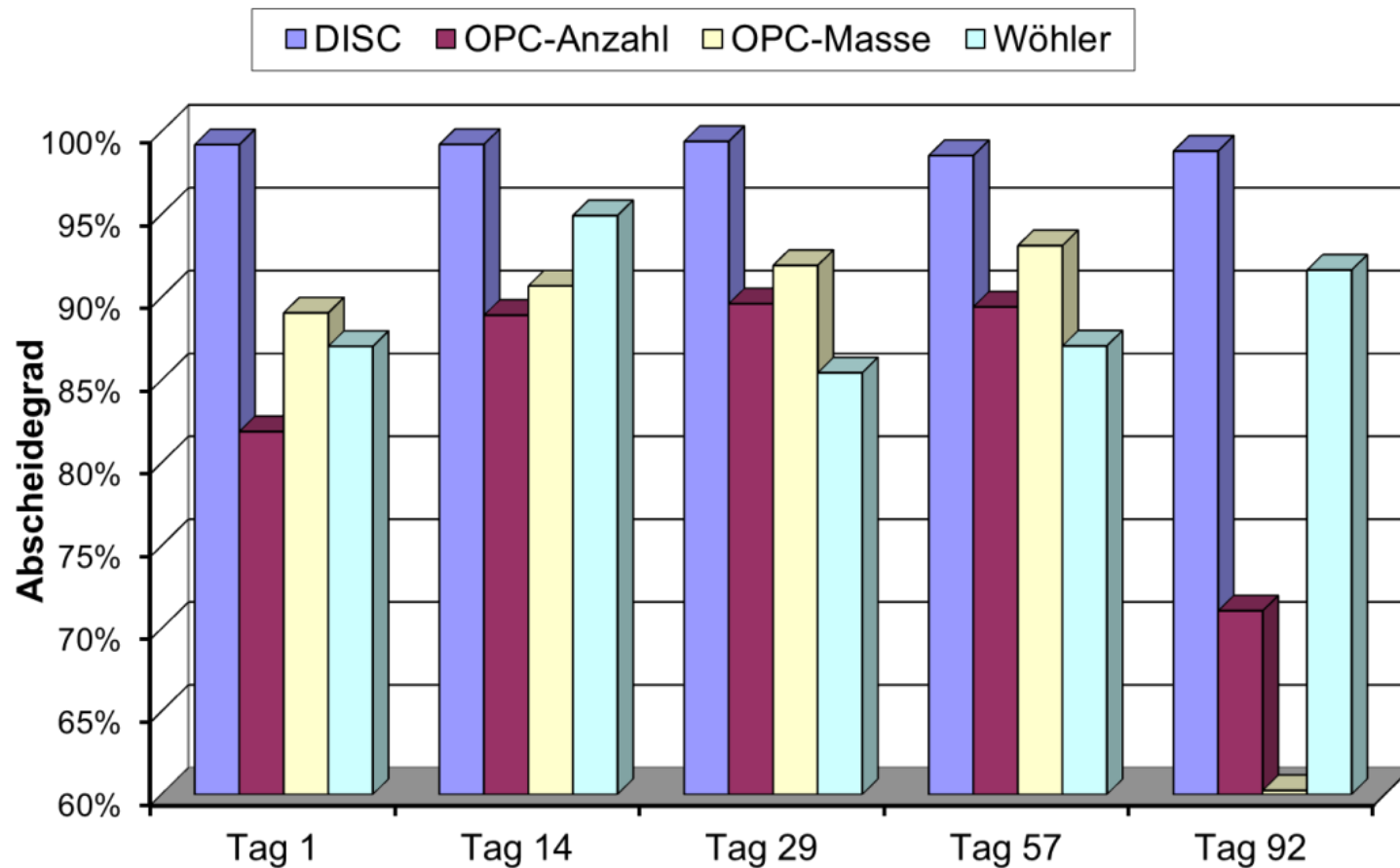


Field-measurement long-term test

- DiSC (Diffusion Size Classifier): Measures particle number from 3 to 300 nm (particulate matter).
- OPC (Optical Particle Counter): Measures particle size and size of 0.3 - 30 μm
- Gravimetric filter method with 2 Wöhler measuring devices (before and after the ESP, extraction opening against and in flow direction).
- Gas analyzer (O_2 , CO_2 , CO, OGC) online before and after the ESP.
- Process variables of the ESP (current, voltage, etc.).
- Dust collected from the chimney sweep.



Development in time of the precipitation efficiency



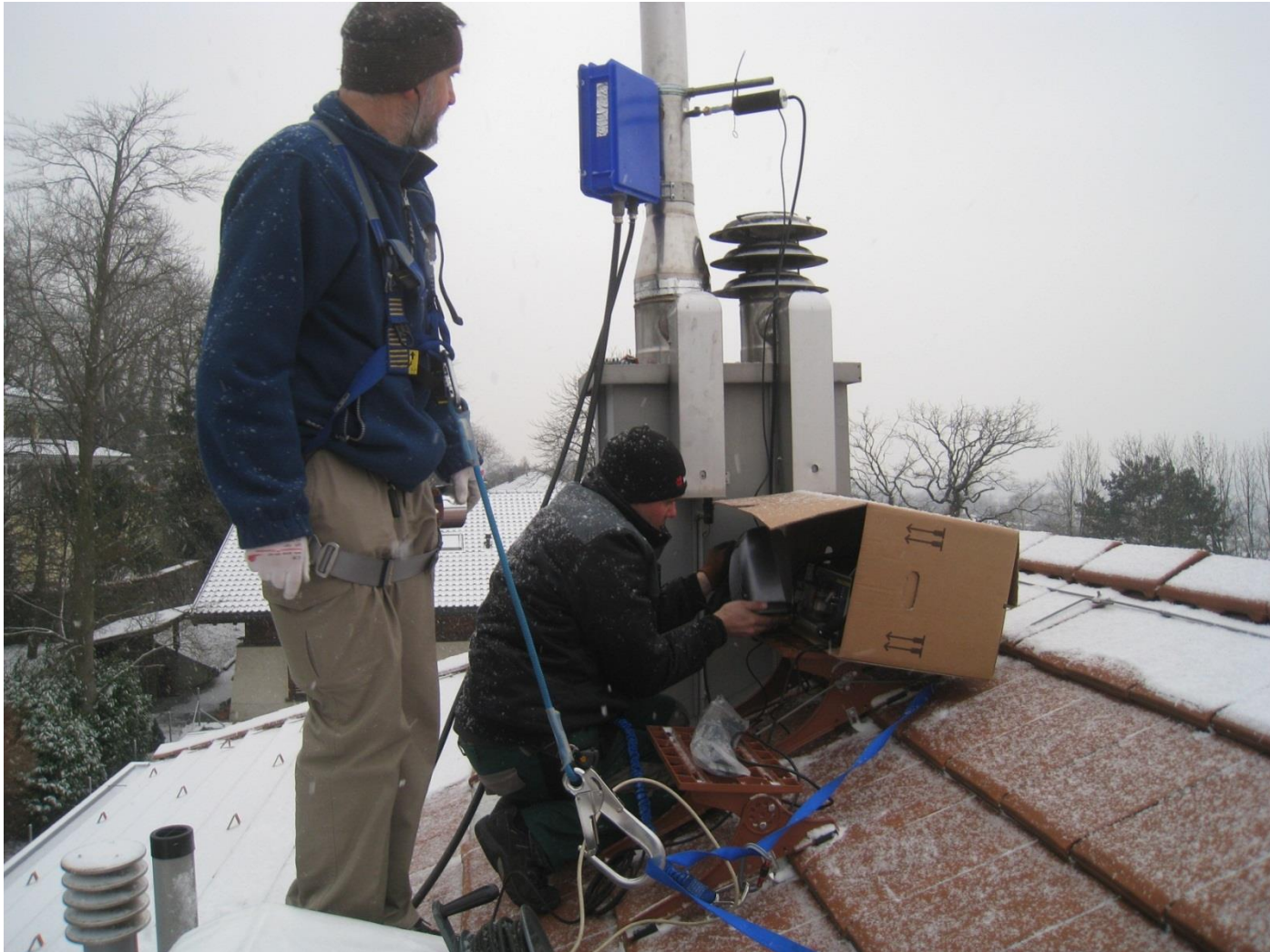
Compilation of different degrees of precipitation over the entire measurement period

Tested Furnaces

1. Log boiler, 40 kW, combustion automatically controlled, 6 h burning time. Fireplace: $\varnothing = 180$ mm, $L = 11.4$ m. Fuel: Hardwood, approx. 50 kg.
 $T_{\text{flue gas}} = 212$ ° C
2. Log chimney, 9 kW (mostly overloaded, ca. 15 kW). Fireplace: $\varnothing = 250$ mm, $L = 8$ m. Fuel: Hardwood 10-15 kg per burning cycle, $T_{\text{flue gas}} = 320$ ° C
3. Pellet stove, 9 kW. Fireplace: $\varnothing_{\text{upper}} = 150$ mm, $\varnothing_{\text{lower}} = 80$ mm, $L = 6$ m, with



Setup field measurement



OekoTube-Inside: Quantity of dust

Rated power: 40 kW

Fuel: Wood chips

Temperature: 160 °C

Volume flow: 190m³/h

Degree of separation: 70%

Raw gas: 60mg/m³

Pure gas: 18mg/m³

Quantity of dust Staubmenge per hour: 7,98g/h

Quantity of dust per year: **15,96kg** (2000Bh)

Dust collection in condensate layer

Ø:180mm

Length: 250mm

Volume: 5 l



500 working hours



800 working hours

