# Aeroseal – Your key to open up energy efficiency in ventilation and much more...

# What is Aeroseal?

„Aeroseal is a unique technology to improve indoor environments and energy efficiency in buildings by sealing leaks in ventilation systems “

# AEROSEAL history

- Aeroseal was invented 1994 by Prof. Marc Modera, Berkley Labs, USA
- Licensed by MEZ-TECHNIK from Aeroseal LLC USA for Europe since 2015
- Currently 55 independent Aeroseal licensees provide sealing services in Europe more than 650 worldwide
- In Europe more than 1.000 commercial Aeroseal projects carried out on new buildings & retrofits so far…


TLC
späth
WIELAND SCHULTZ
Windmüller Technik GmbH
gesa
MJF
Blitzsauber
AEROSEAL STUTTGART
aero technik
BWB
NTI
MIWA
ROM
CLEANSWAY
B.ARC
Caverion
KLIMAKANALBAU
HOPPE
ASAG eco AG
AGO AEROSEAL
Meier-Kopp AG
Lippuner
hygienair
ImL AEROSEAL
Nordiska Skorstensprodukter AB
CONDUCT
omnino
ghasman
DCS Duct clean Scotland
SPECTRUM ENGINEERING LIMITED
TAS Total Air Solutions
Air Innovators
NORTHAIR
ENERGY AIR
DEMAK
ventilace.eu
PROSEAL
EcoStations
Stokjes
LOMATTEC
MAP CLIM
SOGESTFA
Groupe DE PRA
aire limpio
AEROSEAL
IPIKO - REX
ALISEA

# Why is Aeroseal a game changer?

- Example Germany: nearly 3 million non-residential buildings have HVAC systems
- Ventilation systems plays a **key role** to optimize the energy efficiency of these buildings
- Approx. **30-50% of building energy costs** are related to ventilation and air conditioning systems (e.g. fan energy, heating/cooling, humidifying/dehumidifying, etc.)
- 1,00 $m^3$ of leaked air per hour causes **costs of EUR 1,00 to 3,00** and more **per year!**
- To reach a maximum in savings Aeroseal must become the **foundation of all retrofits** in ventilation and a standard application in new construction

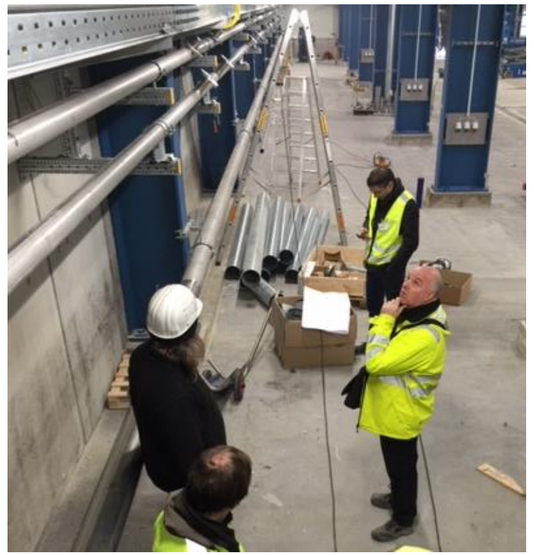
# Let‘s face it - There is no tightness in ventilation!

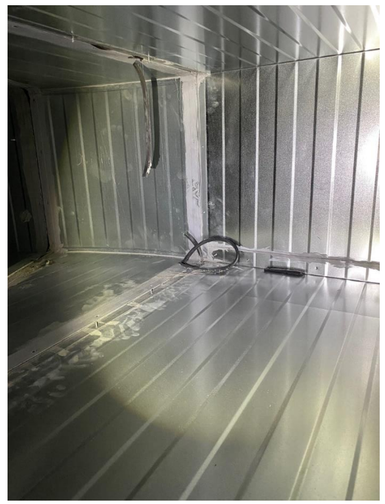
- **Normative requirements for the tightness of ventilation systems are generally not fulfilled** and "could not" be proven representatively so far

  - *Tightness according to: EN 1507/12237 - minimum B, recommended C*
  - *Hygiene requirements: VDI 6022, EN 15780 - at least C, often D*
  - *Commissioning/handover of ventilation systems: EN 12599, more realistic testings*
  - *Energy efficiency: EN 16783-3 - new classification system ATC 1 to 7*
  - *Higher legal energy efficiency requirements according to EBPD / GEGs*

- **Leakages have always been a taboo** because there was no efficient solution

- **Pressure on the ventilation industry is rising:**
  - Law requirements
  - New regulations
  - Rising energy price
  - Building owner & operator requirements





# Why do ventilation systems leak at all?

## 1st step – Planning

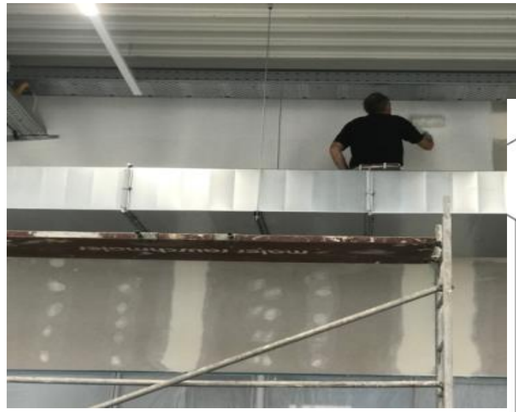
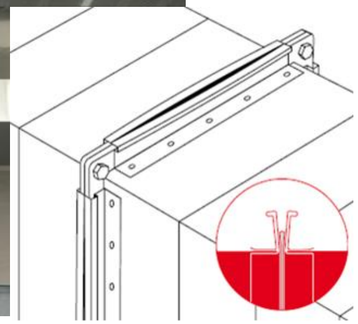
- Common practice: 10-20% air volume surcharge
- Usually no tender for airtightness or airtightness testing
- No, inadequate or non-representative leakage testing

## 2nd step – Manufacturing



## 3rd step – Transport & handling

## 4th step – Installation

## 5th step – TAB & services

- Cleaning during handover
- Testing, adjusting and balancing (TAB)
- Defects are usually revealed here

# Tightness - Big gap between wish and reality!

| Air tightness class | | Limit value air leckage $f^{max}$ | Leckage ca. in % |
|---|---|---|---|
| new | old | (in $m^3/s$) | |
| **ATC 7** | | | ATC 7 = 15-40% |
| **ATC 6** | **2,5 x A** | 0,0675 • $pt^{0,65}$ • $10^{-3}$ | ATC 6 = 15% |
| **ATC 5** | **A** | 0,027 • $pt^{0,65}$ • $10^{-3}$ | ATC 5 = 6% |
| **ATC 4** | **B** | 0,009 • $pt^{0,65}$ • $10^{-3}$ | ATC 4 = 2% |
| **ATC 3** | **C** | 0,003 • $pt^{0,65}$ • $10^{-3}$ | ATC 2 = 0,22% |
| **ATC 2** | **D** | 0,001 • $pt^{0,65}$ • $10^{-3}$ | |
| **ATC 1** | | 0,00033 • $pt^{0,65}$ • $10^{-3}$ | |

**REALITY**

If the air tightness class is unknown, **2,5 x A (ATC 6)** is used as the basis for energy calculations!

**Table 1:**
Calculation basis for limit values of leak tightness classes ATC 6 to ATC 1 ($m^3/s$ je $m^2$ Luftleitungsoberfläche) according to **DIN EN 16798 Part 3**. is the respective test pressure

**Source:** *DIN EN 16798 Part 3 (DIN 13779) Ventilation of non-residential buildings – performance requirements for ventilation, air conditioning and space cooling systems*

# 10 more significant potentials to open up!

1. **Noise reduction** caused by leakages
2. Elimination of **odours** (e.g. kitchen exhaust air, laboratories, office complex...) distributed within building
3. Higher **air exchange rates leads to significant indoor air quality / environment (IAQ / IEQ) improvements**
4. Better **air distribution leads to more comfort**
5. **Improvement of pressure conditions in between building sections** (elimination of uncontrolled air ingress/egress into other parts of the building)
6. Increase of **air hygiene** by preventing decontamination of already filtered air, by ex- and infiltration
7. Smaller ventilation systems in new constructions, as **volume flow surcharges are no longer necessary** during planning
8. Reduction of **overall construction/refurbishment costs** (room volumes, statics, sound and heat insulation, fire protection, insulation...)
9. Fewer **lawsuits** and elimination of costs for lawyers, experts and consultants
10. **Planning security** through guaranteed air tightness

# How does it work?
# Aeroseal process in 10 steps

1. Definition of the systems to be sealed (Ø 120 meters length)
2. Disconnecting or preparing the air handling unit (AHU)
3. Close all outlets/inlets at the ventilation system
4. Protect sensors and heat exchangers, smoke and fire detectors
5. Connect the Aeroseal equipment
6. Pre leakage test to determine the initial situation
7. Sealing process (5-60 min)
8. Do a final leakage test and create a corresponding certificate
9. Re-establish the system
10. Balancing of the system

**Duct Sealing Performed For:**

AEROSEAL Test
Bierwiesenstrasse
Reutlingen, BW 72770

**AEROSEAL CASE ID:** 3316
**SYSTEM DESCRIPTION:** Software 4-3-3-23 Test
**SEAL DESCRIPTION:** Test 2
**HARDWARE:** EuroSeal
**TECHNICIAN:** Diesel

**DATE:**
29/9/2021

**Overall Sealing Results:**

**BEFORE SERVICE**
36.6 L/s of Leakage, equivalent to 17.9 cm² Hole or 11% of the system capacity of 321.9 L/s

**AFTER SERVICE**
Less than 2.4 L/s of Leakage, equivalent to a 1.2 cm² Hole

**Leakage test: PASS**

This corresponds to a
**94% Reduction in Duct Leakage**

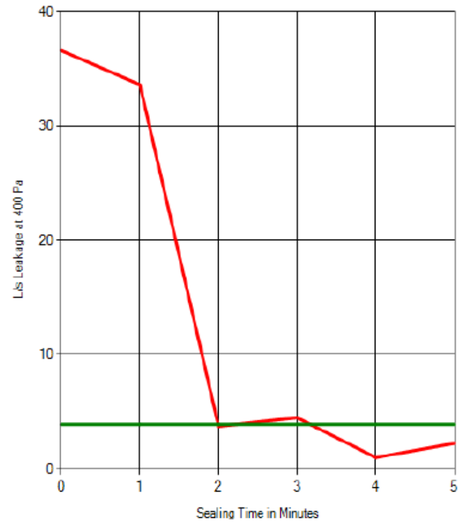
| | |
|---|---|
| ATC: | ATC1 |
| Allowable Air Leakage: | 3.9 L/s |
| Achieved Air Leakage: | 2.4 L/s |
| Surface Area (ft²): | 240.0 m² |
| Operating Pressure: | 400 Pa |

Leakage based on surface area

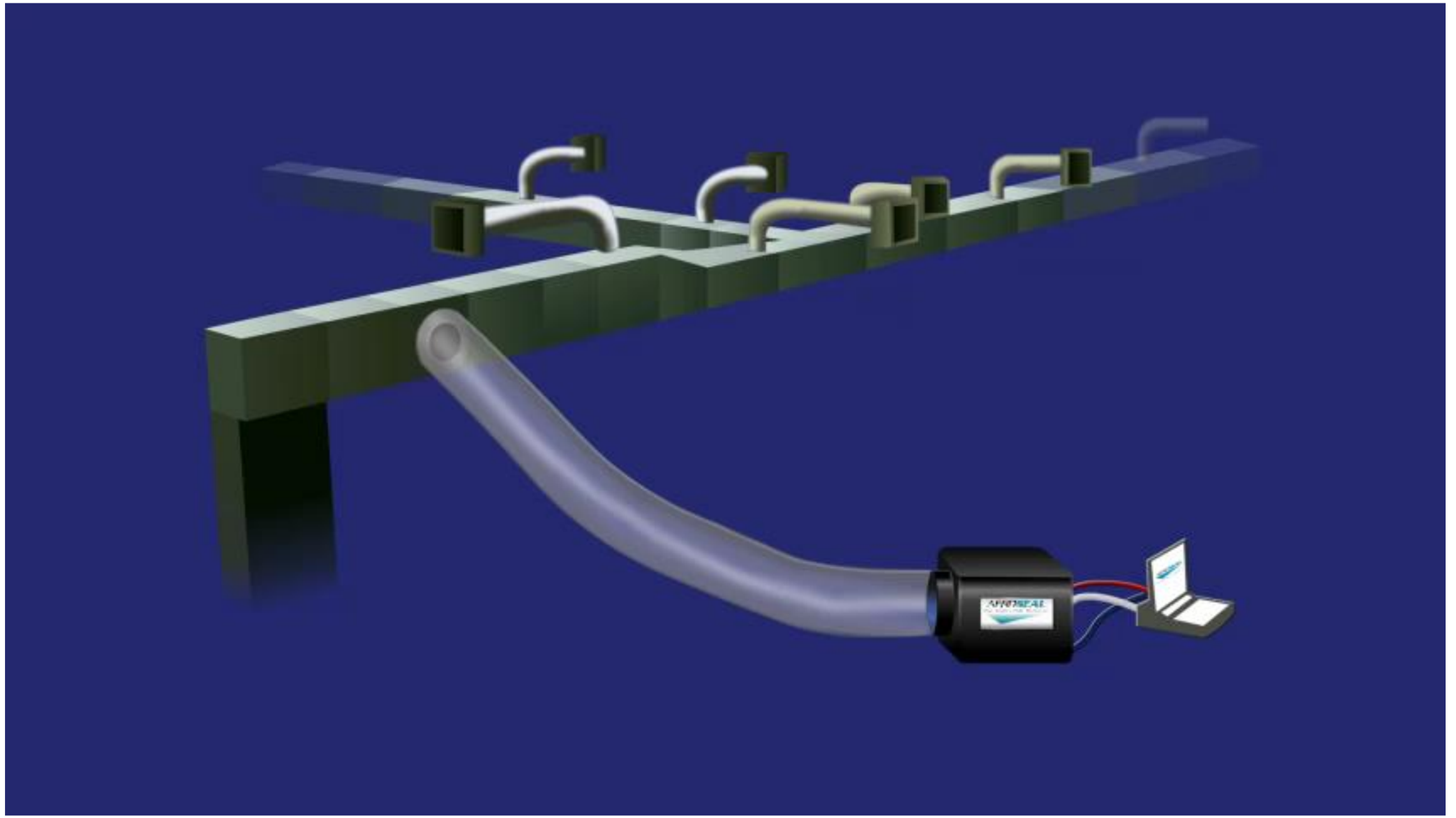
| | |
|---|---|
| ATC1 | 3.89 L/s |
| ATC2(D) | 11.79 L/s |
| ATC3(C) | 35.37 L/s |
| ATC4(B) | 106.12 L/s |
| ATC5(A) | 318.36 L/s |
| ATC6(2.5xA) | 795.89 L/s |

**NOTE:** Duct leakage results are reported at the stated operating pressure of 400 Pa. The results are extrapolated per applicable portions of EN12237/ EN1507/ EN16798-3.

**Aeroseal Sealing Progress:**




# Aeroseal process simulated



# Characteristics of Aeroseal?

- Polyvinylacetate (PVAC/PVA) is an odourless, environmentally friendly sealant material
- Free of solvents / VOC
- Complies with all relevant standards
- Temperature resistant from -29°C to +249°C
- Flame retardant
- Durability of 30 years plus
- Warranty of 10 years after application
- Fulfills the highest green building requirements (for example DGNB & LEED)
- Tested and suitable for components such as fire dampers etc.
- FDA/NSF conformity (pharmaceutical, food and cleanroom technology)
- Can be used for smoke extraction ducts (sheet metal and silicate ducts e.g. PROMAT)

# Scania Production – Meppel (Netherlands)

| | |
|---|---|
| **Location** | Meppel, Netherlands |
| **Date** | December 2020 |
| **MEZ-AEROSEAL-Partner** | Air Innovators B.V., Netherlands |
| **Client** | Scania Production Meppel B.V. |
| **Building type** | Production line / Industry |


## Development air tightness class

| Before sealing | After sealing |
|---|---|
| 267,6 L/s | 8,0 L/s (97% improvement) |

## Problem

- Discharge of toxic gases / paint particles due to large leakage
- High energy consumption
- Performed leak test did not meet requirements
- Truck production was not allowed to be affected

## Solution

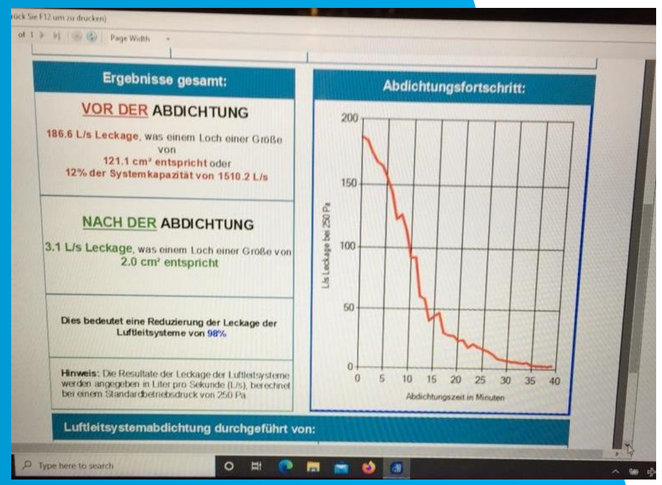
- Tightness class D (ATC2) was achieved through Aeroseal
- No impairment of production
- Further projects at Scania in prospect

# Project example:
# Cosmetic & pharamceutical company

| | |
|---|---|
| **Location** | Bielefeld, Germany |
| **Date** | November 2020 until March 2021 |
| **MEZ-AEROSEAL partner** | BWB-CM GmbH, Germany |
| **Customer** | Dr. Kurt Wolff |
| **Building type** | Office building, production and warehouse |

## Improvement of the tightness by 95%

| Pre-Sealing | After Sealing |
|---|---|
| Class 2,5xA | Class C, partly D |




# Background

- **Approx. 15-30% leakage** in existing system - high energy costs
- Partially **failed leakage tests** (no pressure build-up possible due to excessive leakage)
- **Energy efficiency calculation** based on field data collection illustrates **great savings potential**

# Implementation

- Execution of retrofits & sealing **during ongoing operation**
- **Minimal interruptions** to operation due to time-saving execution
- Refurbishment possible in existing buildings, **no new installation necessary**
- Achievement of air tightness class C and partly D, i.e. **less than 0.22% leakage**
- Retrofit in combination with fan replacements

# Savings kW/h and EUR after sealing

| Project information | |
|---|---|
| Building type | Production, office, warehouse |
| Class start | 2,5xA (ATC 6) |
| Class results | C (ATC 3)/D (ATC4) |
| Number of injections | > 50 |

| Parameters ventilation system | |
|---|---|
| Runtime | 6.630h per year |
| Class start | 2,5xA (ATC6) |
| Average operating pressure | 400 Pa |

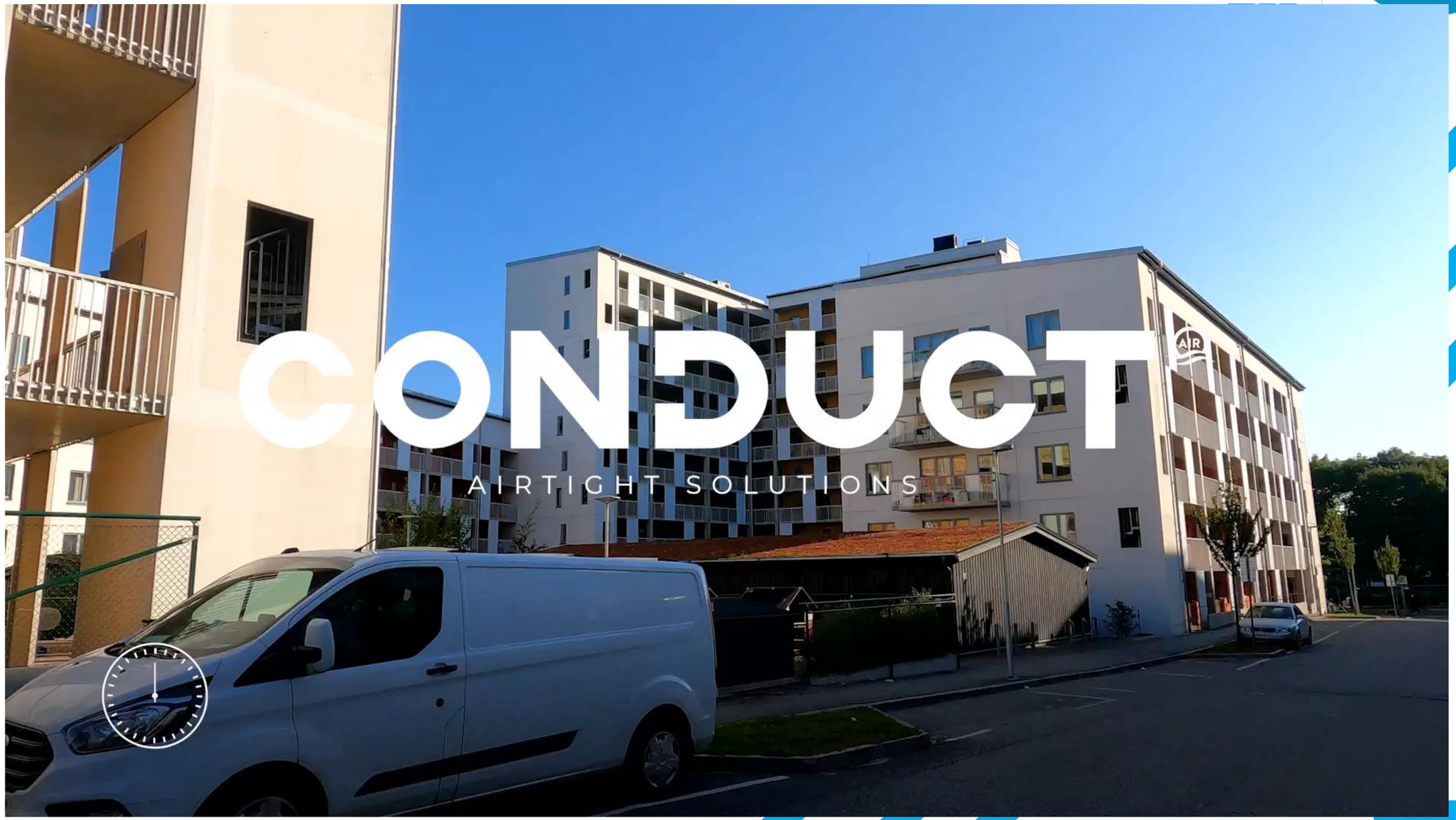
| Calculated values | |
|---|---|
| Power consumption **OLD** | 505.000 kW/h |
| Power consumption **NEW** | 221.000 kW/h |
| **= Power saving fan power** | **284.000 kW/h** |
| **Total savings per year** | **~ 54.000,00 €** |

| Exemplary ROI consideration | |
|---|---|
| Ventilation system | Production 1st floor |
| **ROI** | **~ 1,5 years** |

IMPORTANT: Without taking into account cooling and heating energy and other factors!

**Source:** *Dr. Kurt Wolff, Detlef Malinowsky (IBDM)*

# Example Aeroseal sealing at multi family dwelling



# So why should Aeroseal become a standard application within your retrofit activities and new constructions?

- **Operating costs** of your ventilation systems can be **reduced by at least 50%**
- **Improvement of air quality, hygiene and comfort** in your buildings
- Cost-efficient **retrofit during operation**
  - *Sealing process in 10 min to 60 min*
  - *Low personnel deployment with only 2 technicians*
  - *Commissioning after only 2 hours*
  - *Applicable to different materials: sheet metal, silicate/PROMAT, concrete, plastic, etc.*
  - *Sealing of 3-5 air duct systems per day*
  - *Sealing of 1-2 air handling units per day*
- Air tightness of the entire ventilation system is **100% proven and certified**
- **Resource-efficient use of materials** compared to conventional sealing tapes, silicones and other sealants

# What could be the next steps?

1. Selection of a suitable object and corresponding ventilation systems for a first use case
2. Forwarding of plan drawings (if available) and system information
3. First cost estimation by MEZ-TECHNIK
4. On-site appointment & detailed project planning
5. Estimation/calculation of energy saving potential
6. Project plan & final offer
7. Execution of first test project

# Satisfied customers and partners…

Example case studies: https://www.mez-technik.de/en/mez-aeroseal/case-studies-references.html

Thank you for your attention!