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Exhaust Hoods And Air Supply Units Wagener Gastronomie Engineering (WGE)

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1. Company Profile

- Privately owned family business run by Dipl.-Ing. Heinrich Wagener.
- In-house development of various types of exhaust hoods with high complexity when required, using newest design software and latest technology to deliver ready product supported by long experience in industry.
- Research and development of exhaust system based on latest technology and in cooperation with several universities, their specialists and laboratories.
- Our 60 and growing, highly qualified and skilled Engineers, Technical designers and Processing technicians in production line producing various highly complex components for cruise industry.
- 15.000m² of production area and facilities with large storage capabilities for continues and uninterrupted production line.
- Our mechanical capabilities are to process Stainless steel sheet's up to 15mm thickness and 6m in length.

2. Different Types Of Exhaust Hoods

Patented and innovative galley exhaust hoods in accordance to needs of the equipment installed below.

Exhaust hoods adapted to the available space and geometry on board. Design developed according to USPH construction guidelines.



- Grease filter hoods adapted to the needed exhaust volume
- Grease filter hoods with two rows of filters
- Grease filter hoods with UVC and wash system
- Grease filter hoods with demand based ventilation

- Grease filter hoods with recirculation air
- Standard grease filter hoods
- Canopies heated and neutral
- WGE exhaust hood 4.0

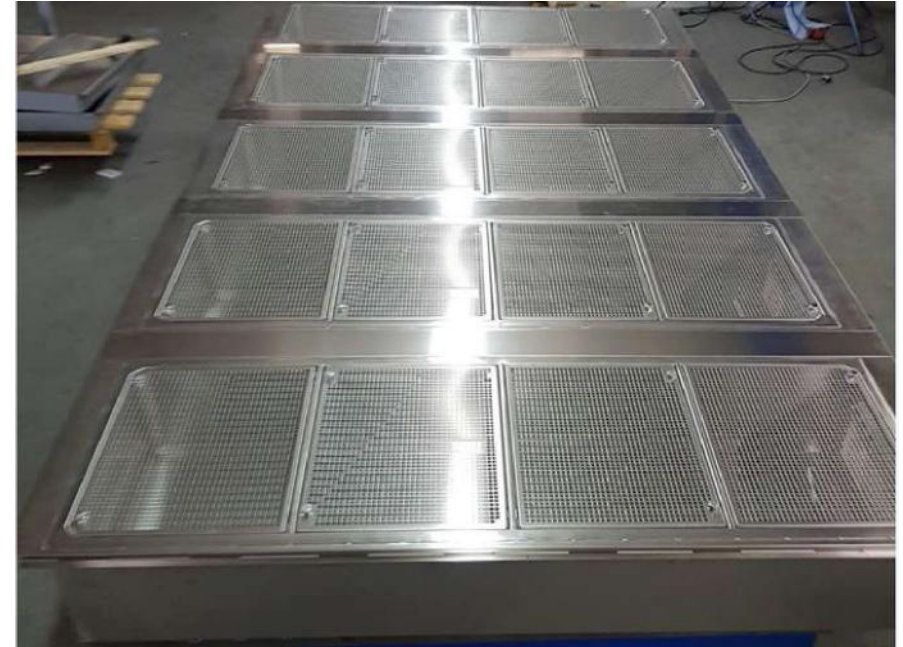
3. WGE Air Supply Systems

Air supply systems in accordance to the needs of supply air
Customized sizes

Lazy air inlets for galley areas



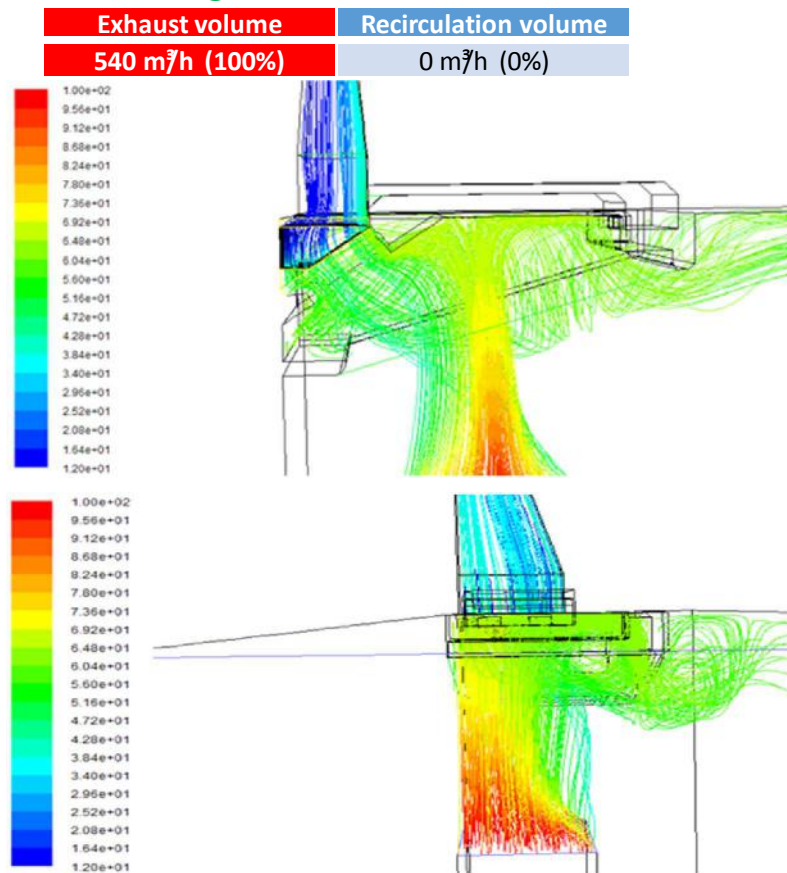
Air supply tower for galley areas



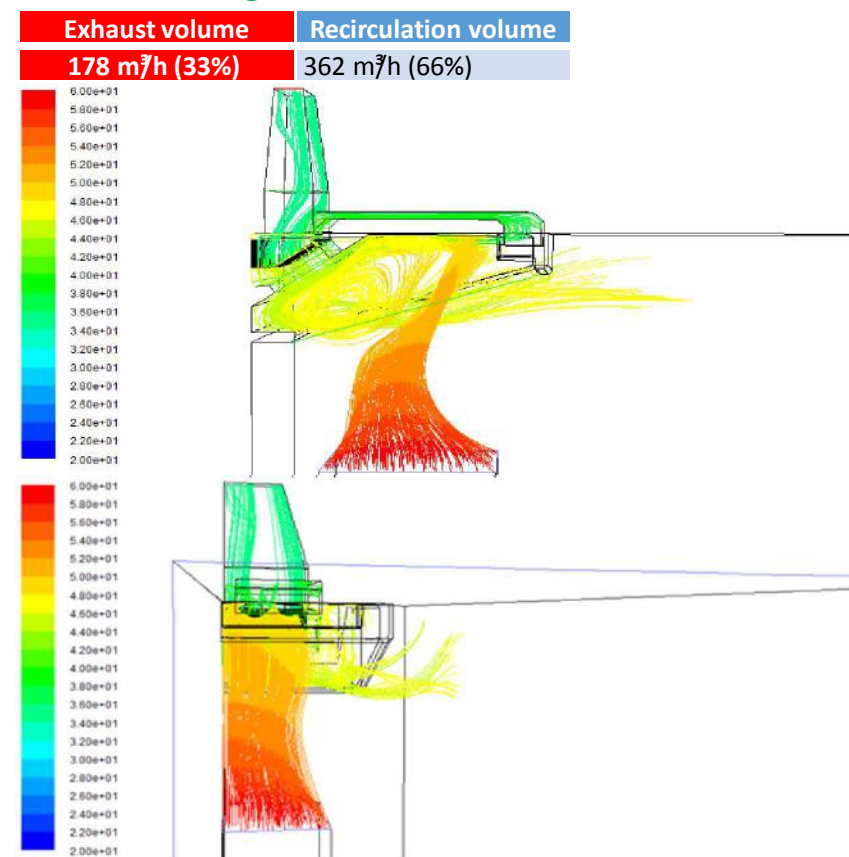
Galley Air supply custom made to suite air volume demand and to fit in to the space in best way

4. WGE Exemplary Computer Simulation Of Recirculation Exhaust Air Hoods At Their Limits

Standard grease filter hood



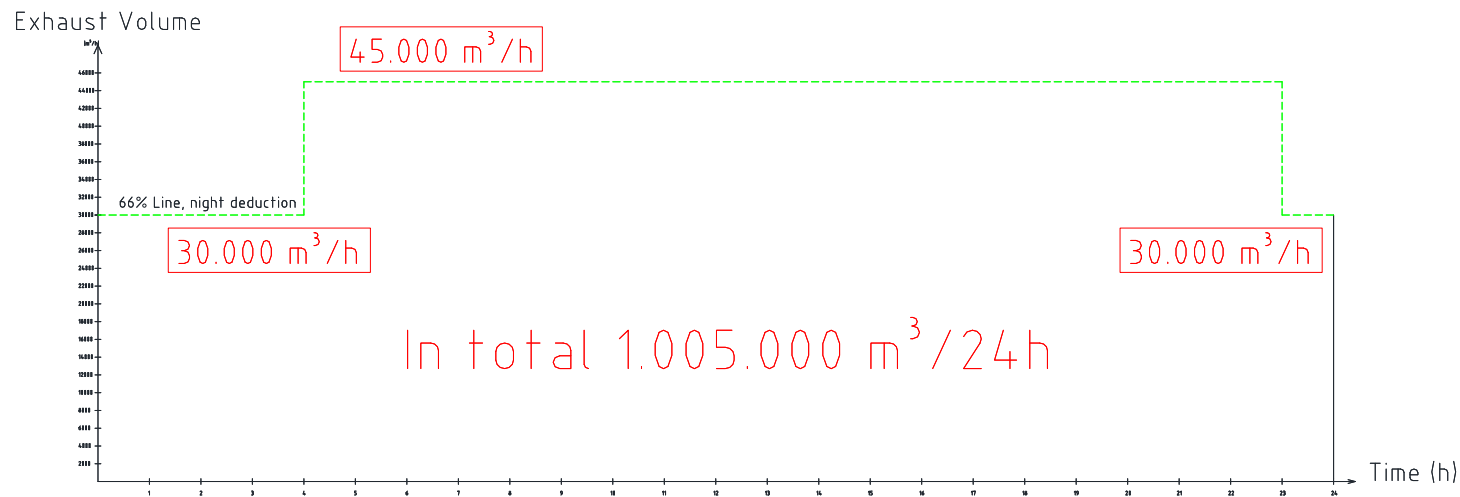
Recirculation grease filter hood



The simulation shows that 66% recirculation air volume and 33% exhaust volume, based on the total exhaust volume in the grease filter is the maximum saving, which can be achieved. With this constellation, as can be seen, the exhaust effect is even better compared to a stand hood.

5.1 Energy Saving With Demand Based Ventilation And Recirculation Air

5.1 Standard grease filter exhaust hoods without energy saving

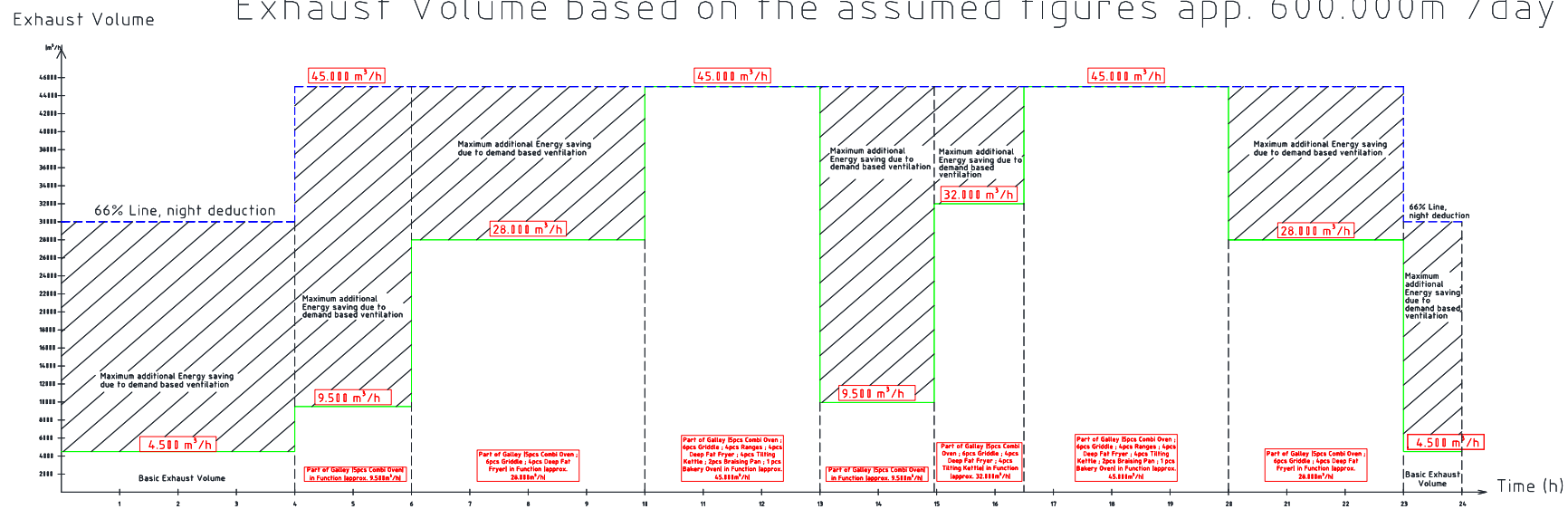


Energy saving with standard hoods only due to night reduction modus

5.2 Energy Saving With Demand Based Ventilation

5.2 Standard grease filter exhaust hoods with demand based ventilation

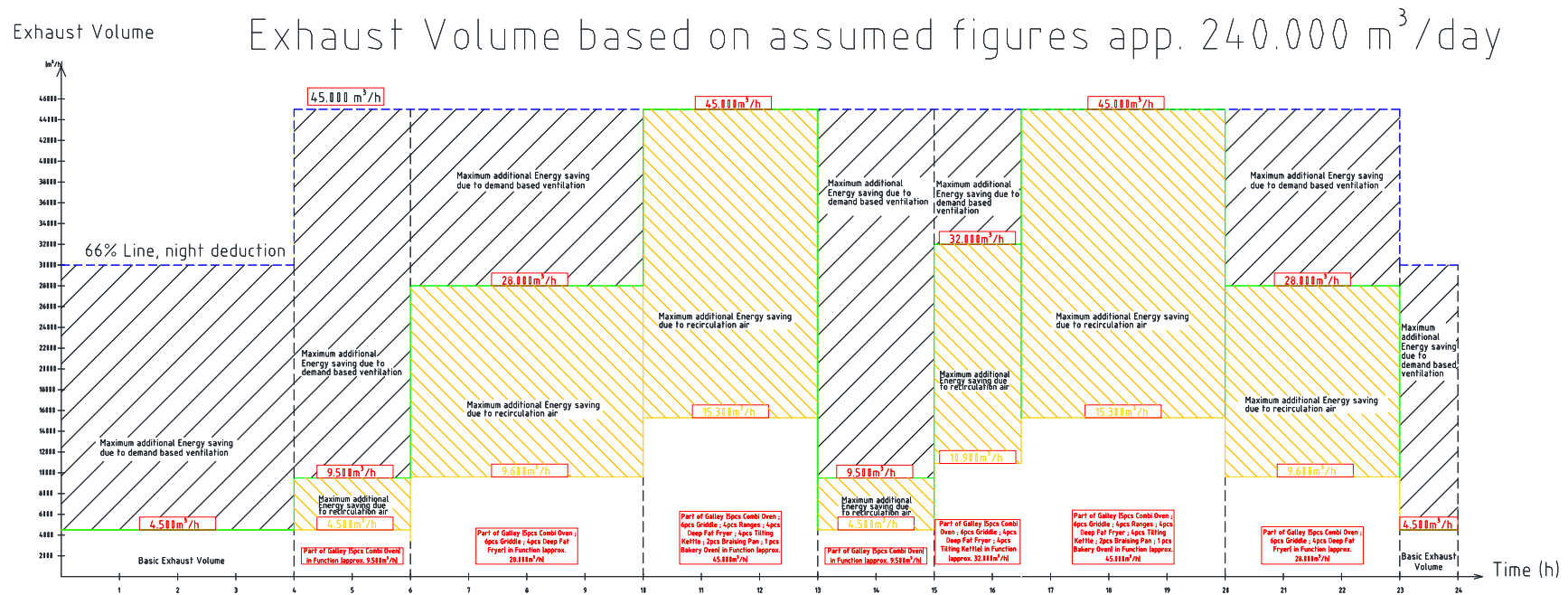
Exhaust Volume based on the assumed figures app. 600.000m³/day



Only exhaust hoods above equipment, which is in service are working.
All other hoods are switched off by dampers to a low level

5.3 Energy Saving With Demand Based Ventilation And Recirculation Air

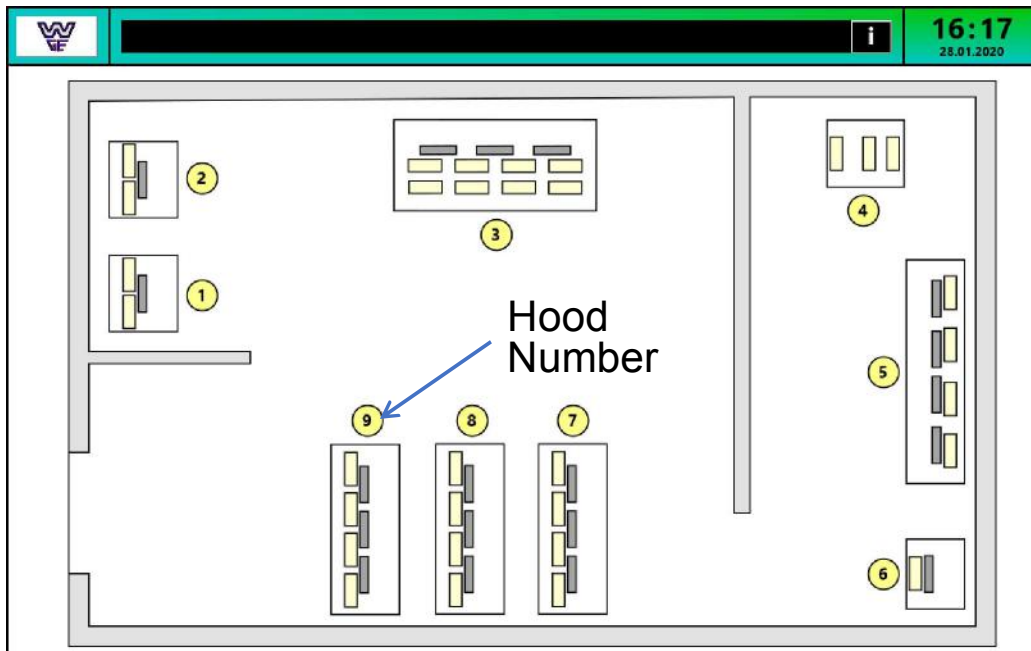
5.3 Recirculation exhaust hoods with demand based ventilation at limit-viewing



Only exhaust hoods above equipment, which is in service working.
Viewing of recirculation air limit. All other hoods are switched off by dampers to a low level

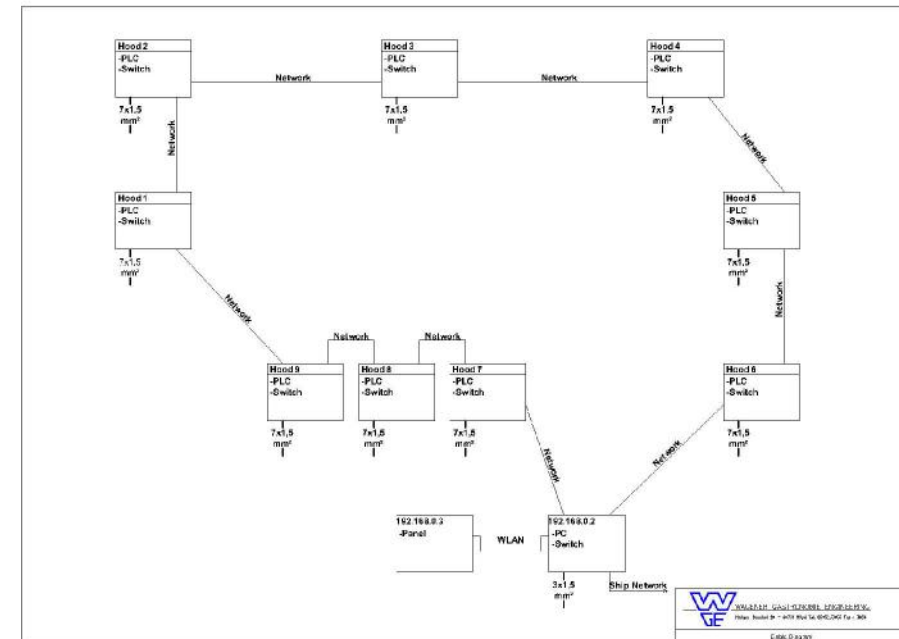
6.1 WGE Exhaust Hood Control System 4.0 With Protective Rights

Via the Galley Layout on the tablet a direct connection to each single hood



Galley Layout showing the status of all to be regulated grease Filter hoods
Yellow: Hood in standby **Green**: Hood in Service **Red**: Hood Failure

Data and power supply diagram for an inexpensive system solution

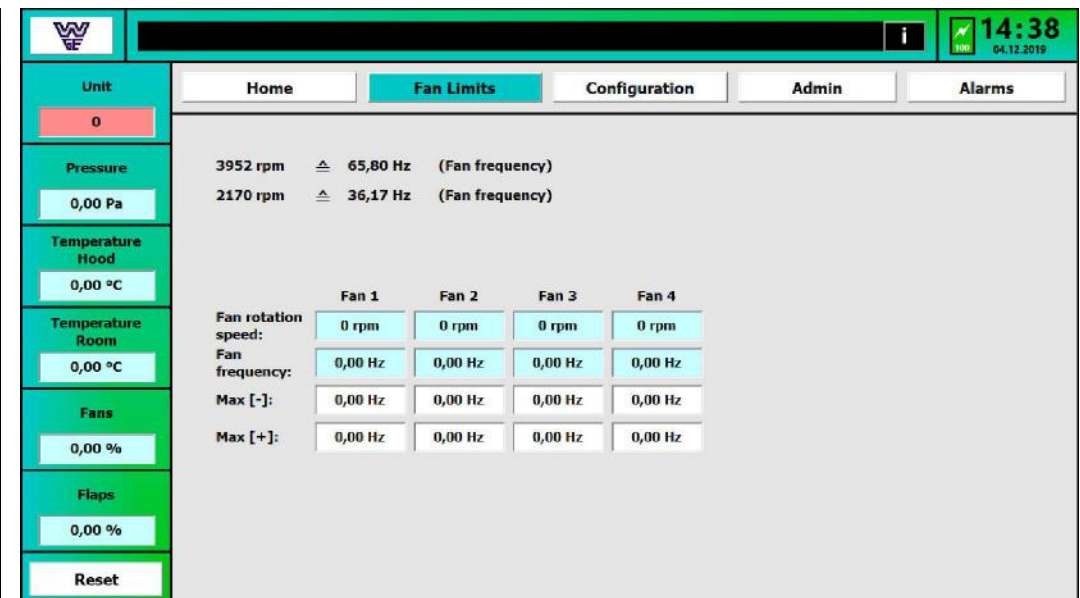
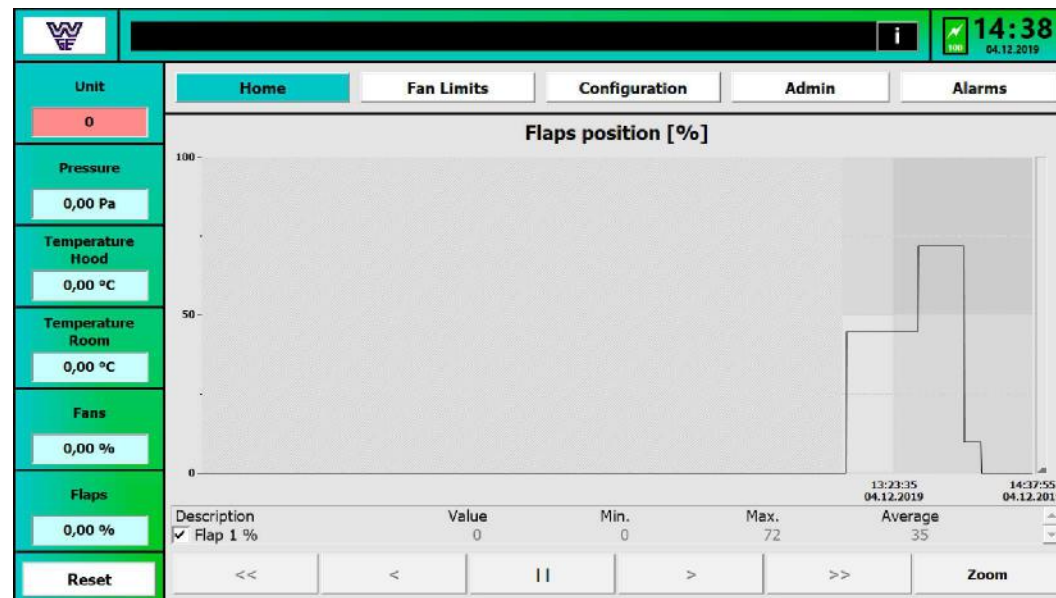


Cable diagram which shows the data and power supply system for all hoods reduced to a minimum

Simplicity and clarity for planning and production on board

6.2 WGE Exhaust Hood Control System 4.0 With Protective Rights

- Ship automation system or galley management system not required
- Reduction of expensive signal cost
- Alone functioning exhaust hood with its own intelligence
- Hoods running on their own simple software accessible via wireless signal



- Opening degree of hood damper automatically arranged to needs
- History and current position of the hood damper will be shown
- Problems in the exhaust system immediately recognizable
- Recirculation fans will be continuously controlled
- Alarm when limit values are exceeded
- Easy setting of limit values

Maximum visualization of the operation status of hood damper

6.3 WGE Exhaust Hood Control System 4.0 With Protective Rights

Unit: 0

Pressure: 0,00 Pa

Temperature Hood: 0,00 °C

Temperature Room: 0,00 °C

Fans: 0,00 %

Flaps: 0,00 %

Reset

Setpoints:
Hood overrun time: 0 min

Automatic: Auto

Start Release:
Temperature offset: 0,0 °C

Standby Mode Flaps:
Flaps position: 0,0 %

Flap Control:
Flap pressure set: 0,00 Pa

Fan Control In Automatic Mode:

	Start cooking operation:	Normal cooking operation:	Difference control range:
Temperature:	0,0 °C	0,0 °C	0,0 °C
Percent:	0,0 %	0,0 %	Minimum operating point = 55% Maximum operating point = 85%

- Set points of exhaust hood can be individually be arranged to the needs
- Easy adjustable pressure set point
- Fan volume in accordance to the prevailing cooking situation

Unit: 0

Pressure: 0,00 Pa

Temperature Hood: 0,00 °C

Temperature Room: 0,00 °C

Fans: 0,00 %

Flaps: 0,00 %

Reset

Sensor Parameters:
Temperature Hood Min: 0,00 °C
Temperature Hood Max: 0,00 °C
Temperature Room Min: 0,00 °C
Temperature Room Max: 0,00 °C
Pressure Min: 0,00 Pa
Pressure Max: 0,00 Pa

Flap Control:
Constant P: 0,0000
Constant I: 0,0000
Constant D: 0,0000
Constant deadband: 0,00 Pa

Reset PID
Reset Hz
S RTP
AHU Stop

- Sensor parameters can be adjusted - For different types of sensors
- Safe return to port function incorporated - All Damper open
- Air Handling Unit Stop reaction incorporated - All Damper closed

Current rotation of fans and set point of sensors can directly be seen
Starting point for cooking mode individual adjustable
Standby mode for flap position adjustable

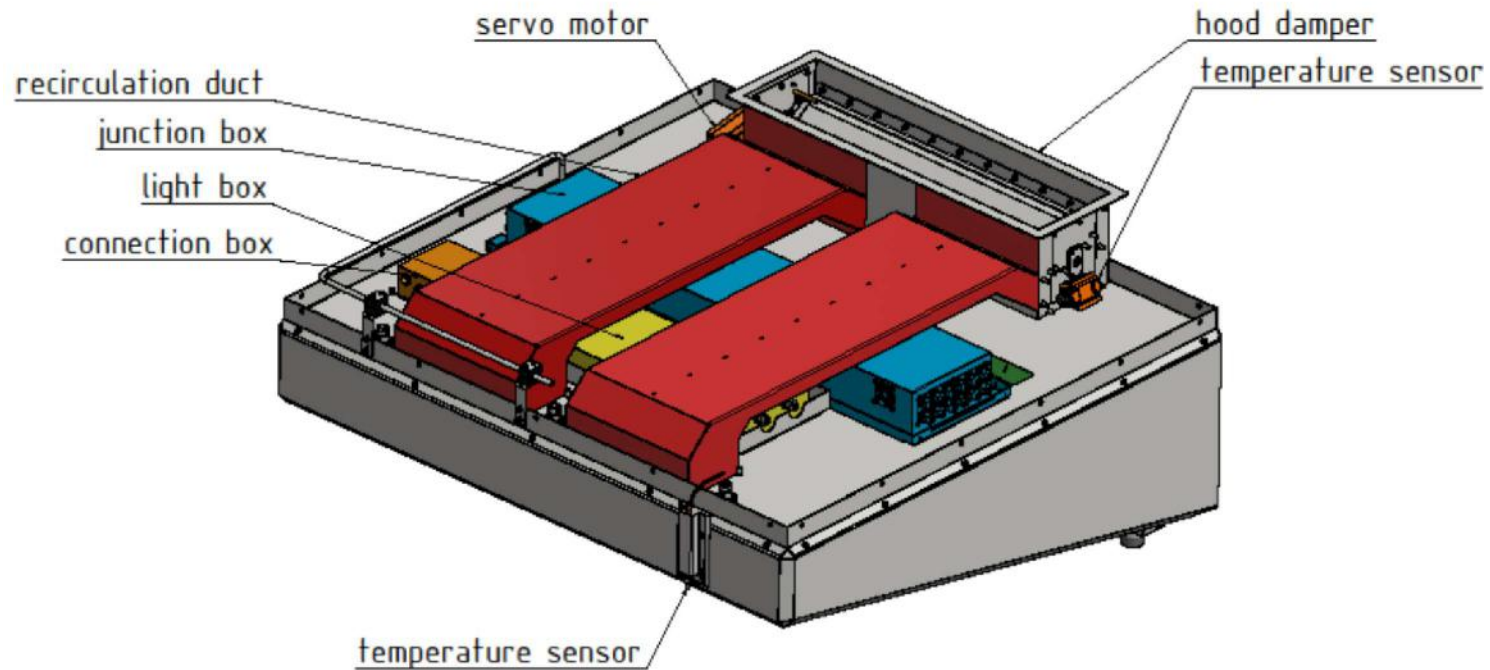
6.4 WGE Exhaust Hood Control System 4.0 With Protective Rights

- Components will be continuously controlled
- Common alarms can be send to the ships control system
- Easy reset of given alarm after correction

- Language can be chosen
- Basic technical information will be shown

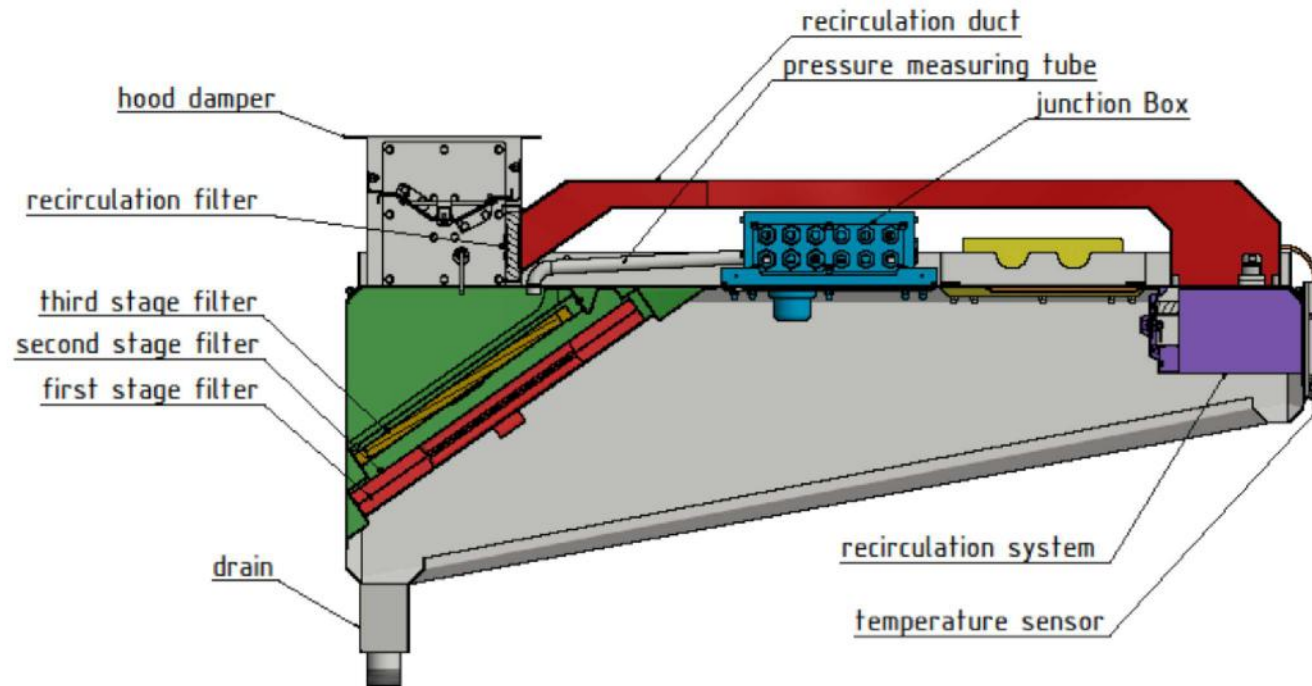
The information page is showing basic information and language can be chosen
All alarms will be stored on the Alarm History page

7.1 Construction Drawing Of WGE Exhaust Hood 4.0 With Protective Rights



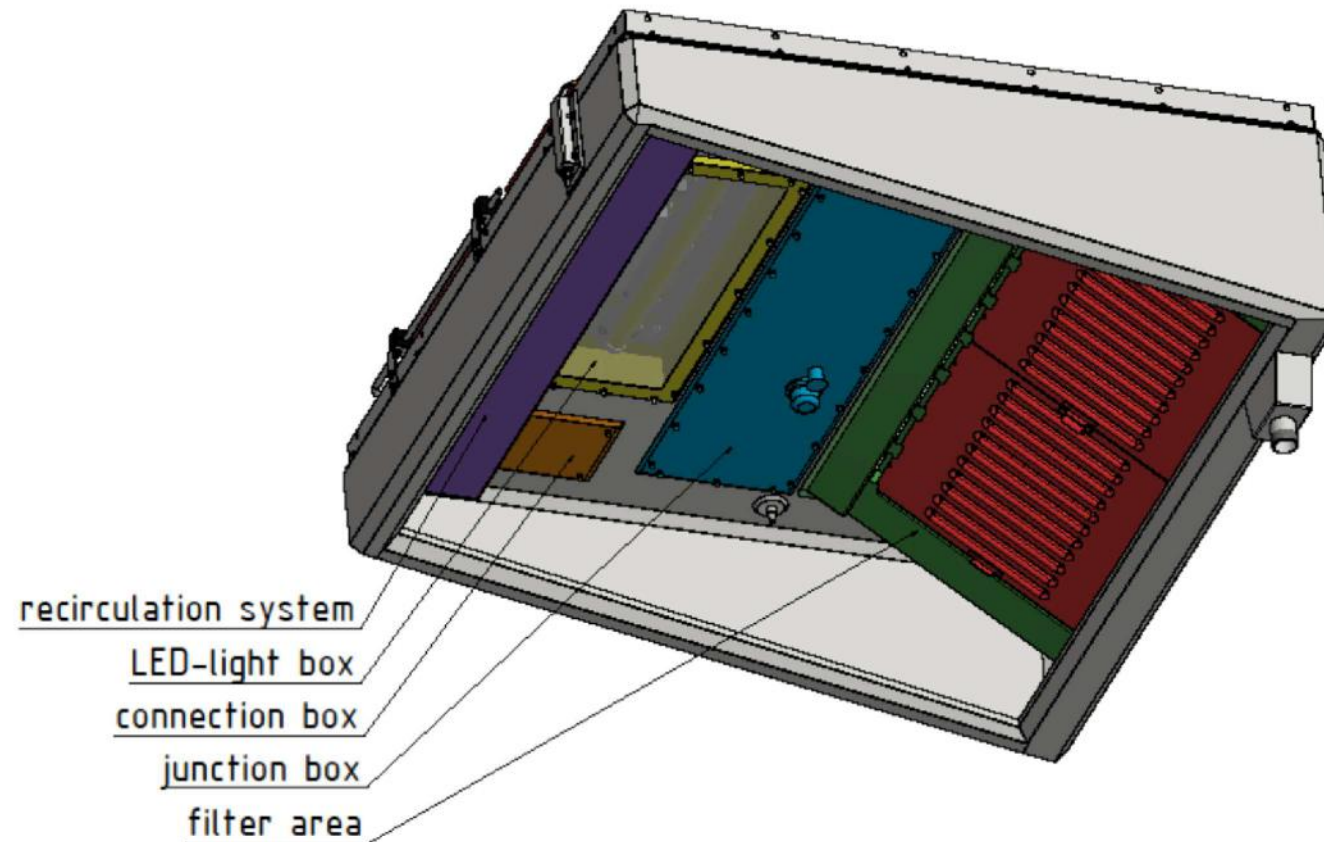
3D Drawing From Top Of WGE Exhaust Hood 4.0

7.2 Construction Drawing Of WGE Exhaust Hood 4.0 With Protective Rights



Section WGE Exhaust Hood 4.0

7.3 Construction Drawing Of WGE Exhaust Hood 4.0 With Protective Rights



3D Drawing From Below Of WGE Exhaust Hood 4.0 / All electrical Connections are reachable from below

7.4 Technical Components Of WGE Exhaust Hood 4.0

Power Supply Unit

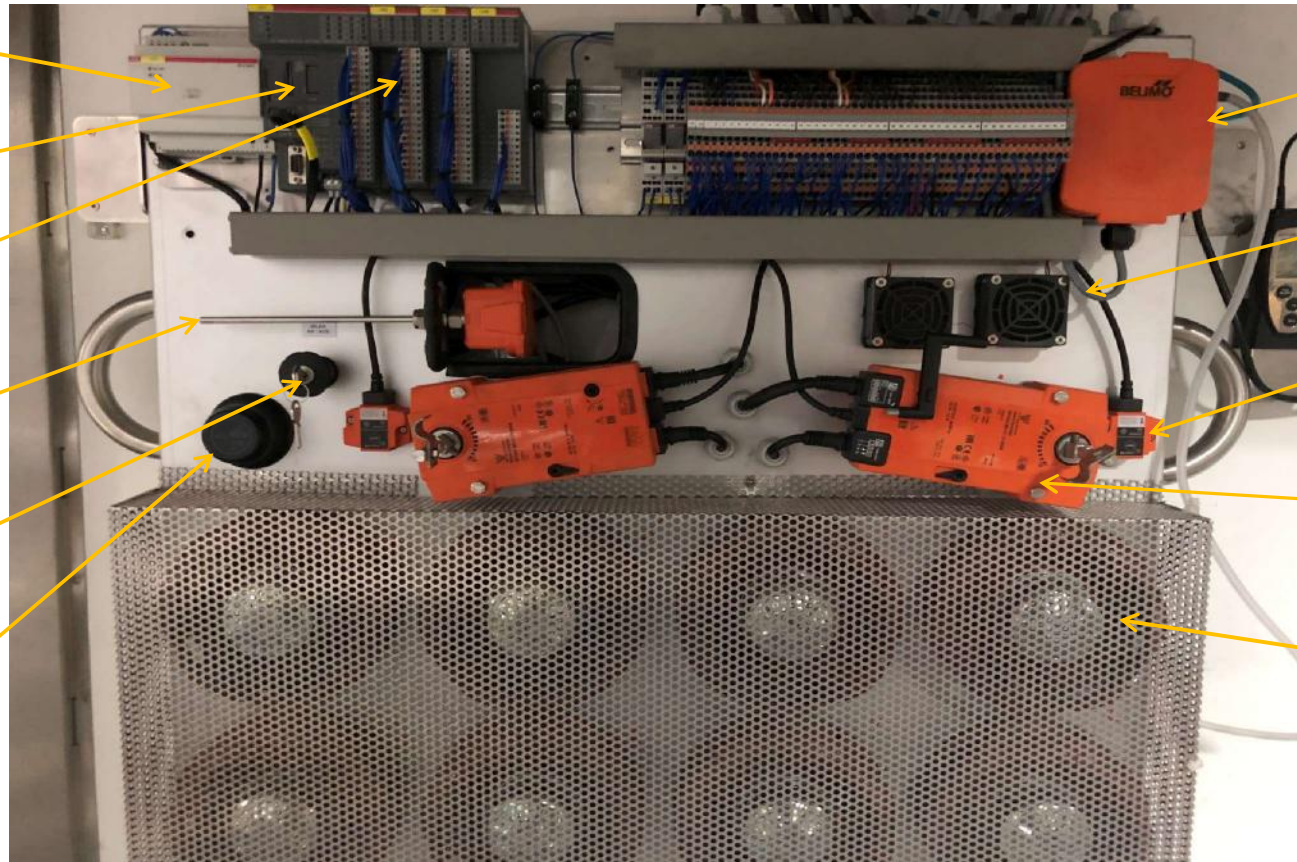
Prog. Logic Controller

Analog IO. Mod

Temperature Sensor

Key Release for Wireless connection

Wireless Bolt Antenna



Pressure Sensor

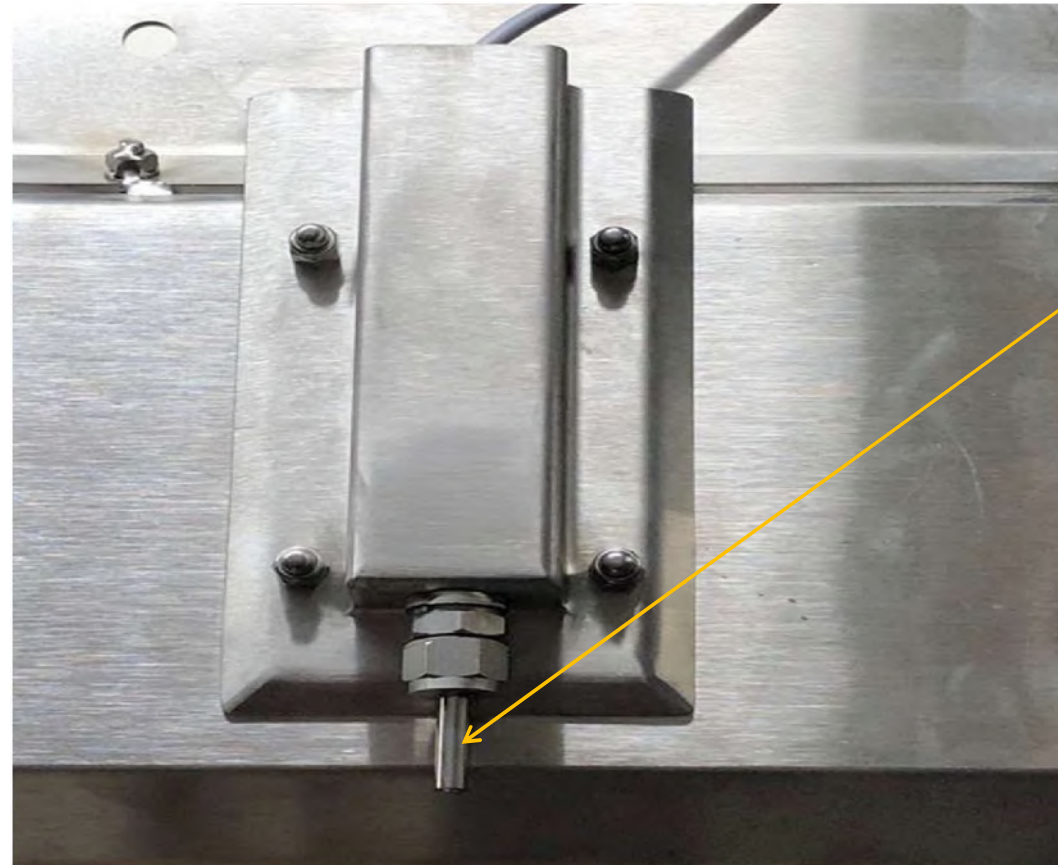
Junction Box Cooling Fans

Thermoelectric Tripping Device

Spring-Return Actuator

Recirculation Fans

7.5 Technical Components Of WGE Exhaust Hood 4.0



Temperature sensor
for measuring room
temperature

Integrated temperature sensor measuring continuously the room temperature for adapting the exhaust hood starting point

8. Main Construction Features For WGE Exhaust Hood 4.0

- No Galley management system and no signals from ships system needed
- New developed 3 stage filter system
- No UV system
- No washing system
- Demand based ventilation
- Recirculation system
- Up to 5 meter long hoods in one piece, completely welded and adapted to the available space
- Our hoods design and development is based on customers feedback and their demand for simplicity

9. Advantages On Yard Construction Side With WGE Exhaust Hood 4.0

- Saving of approx. 800 – 1000 I/O points depending on the requests and project size
- Saving of approx. 3000-4000 meter data cabling depending on project size
- Reduced amount of cables and supply piping means less disturbance during installation
- Easier commissioning of the complete AC-system, due to automatic pressure adaptation
- No control cabinets needed. Space can be used for galley equipment.
- No wash cabinet needed. Space can be used for galley equipment

10. Advantages When Operating The WGE Exhaust Hood 4.0

- Easy adjustment of each single hood to the prevailing cooking situation by wireless access
- In case requested a common alarm for each hood can be provided.
- Automatic pressure adaptation of the exhaust hood to prevailing cooking situation
- Easy adaptation of the exhaust behavior in case of a changed food menu.
- Maximum energy saving by using demand based ventilation and recirculation air.
- Exhaust hood 24 hours in standby

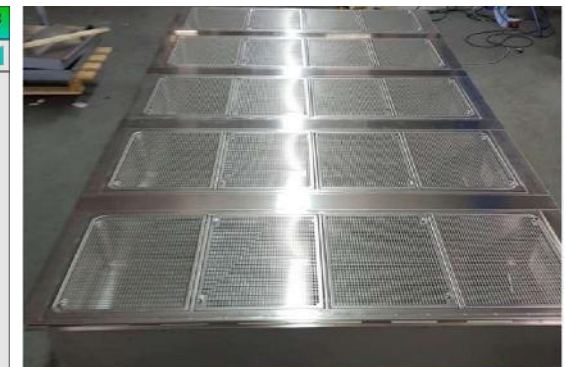
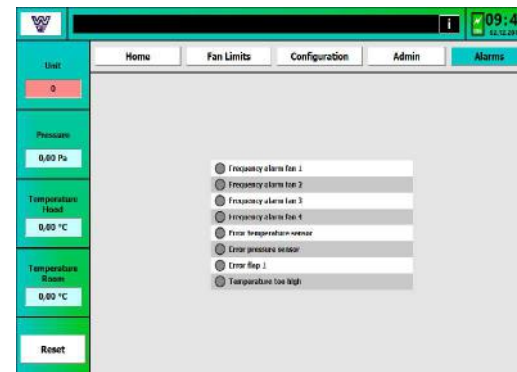
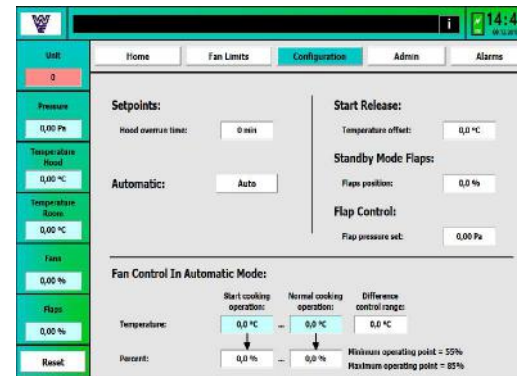
11. WGE Exhaust Hoods And Air Supply Units - Summary

Canopies heated and / or insulated as per demand. Sizes are tailored as per customer request.

Patented Grease filter hoods with (DBV) demand based ventilation and recirculation air for up to 75% energy saving, up to 5 meter length

WGE exhaust hood 4.0 (no connection to ships automation or any similar system needed)

Air supply systems in accordance to the needs of supply air. Any size possible.



12.1 WGE New Developed Grease Filter System For Exhaust Hoods

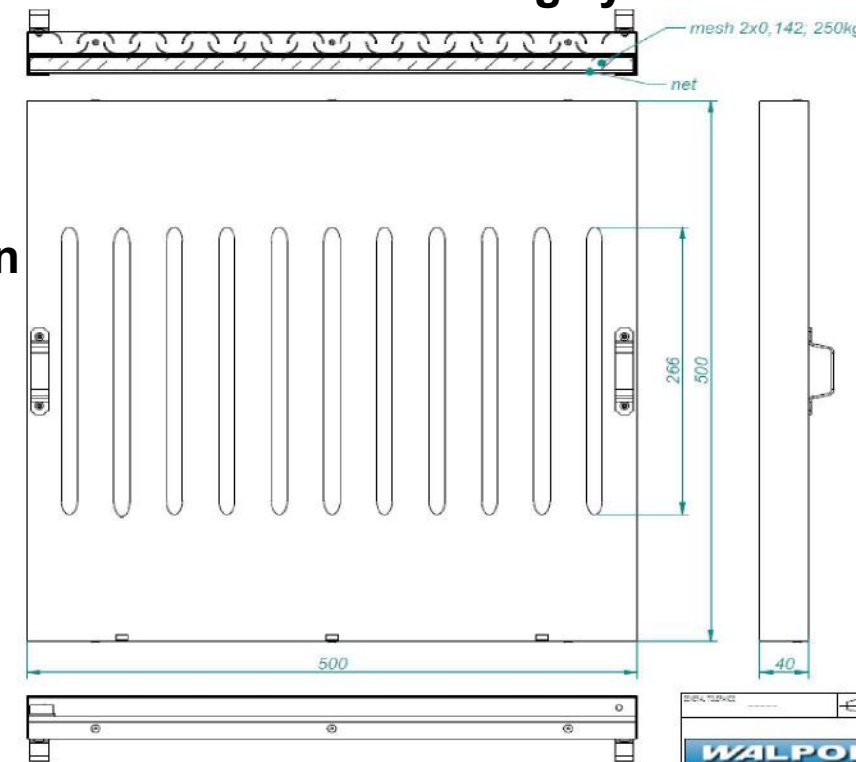
- Photos of ducts, connected to exhaust hoods, which are equipped with our new developed filter system
- No UV systems and no washing systems are existing
- Photos had been taken approximately half a year after commissioning
- No duct cleaning had been carried out till the date the photos has been taken.



12.2 WGE New Developed Three Step Grease Filter System For Exhaust Hoods

Mechanical grease separation in three steps, without UV system and without washing system

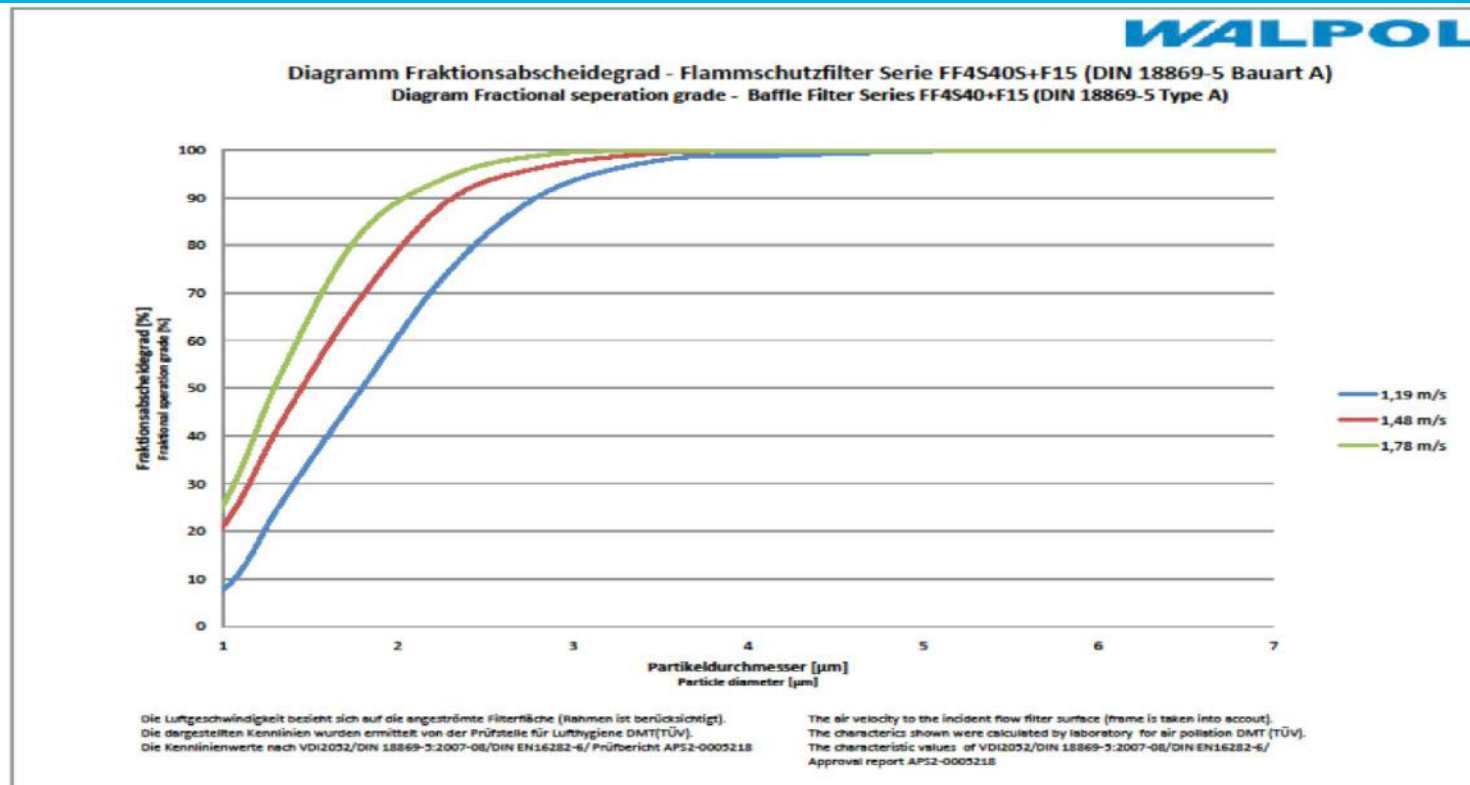
- **Step one: Labyrinth filter for big particles sizes**
- **Step two: Wire mesh filter for small particle sizes**
- **Step three: Wire mesh filter for additional safety separation**
- **The optimum separation speed for every particle size**



Due to their bigger mass, larger fat particles require a labyrinth filter at higher speeds to separate them

Due to their low mass, smaller fat particles need a low speed and cannot be separated by a labyrinth, as they will follow the air flow

12.3 Diagram Fractional Separation Grade For New Developed Filter System



- Fat particles with a size smaller than 1 micron will already be filtered out.
- Fat particles larger than 3 to 4 micrometers and bigger are almost completely filtered out

A Combination of Three Filter Systems reaches a perfect separation grade also for particles smaller than 5 microns

12.4 Diagrams Comparing Fractional Separation And Pressure Loss With Competitor

Diagramm Fraktionsabscheidegrad (640-700 m³/h)
Diagram Fractional separation (ca. 640 m³/h - 700 m³/h)

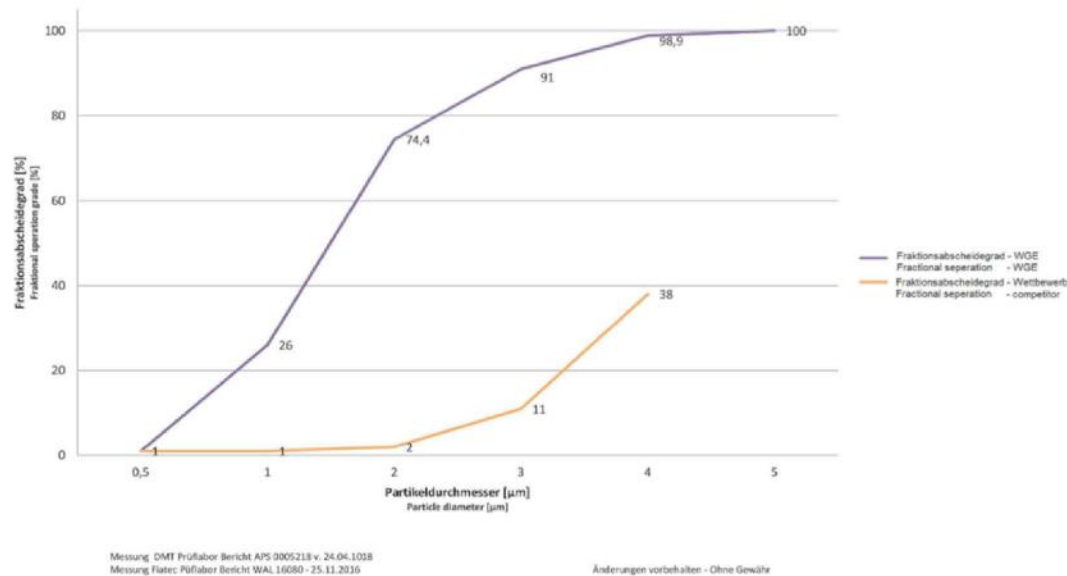
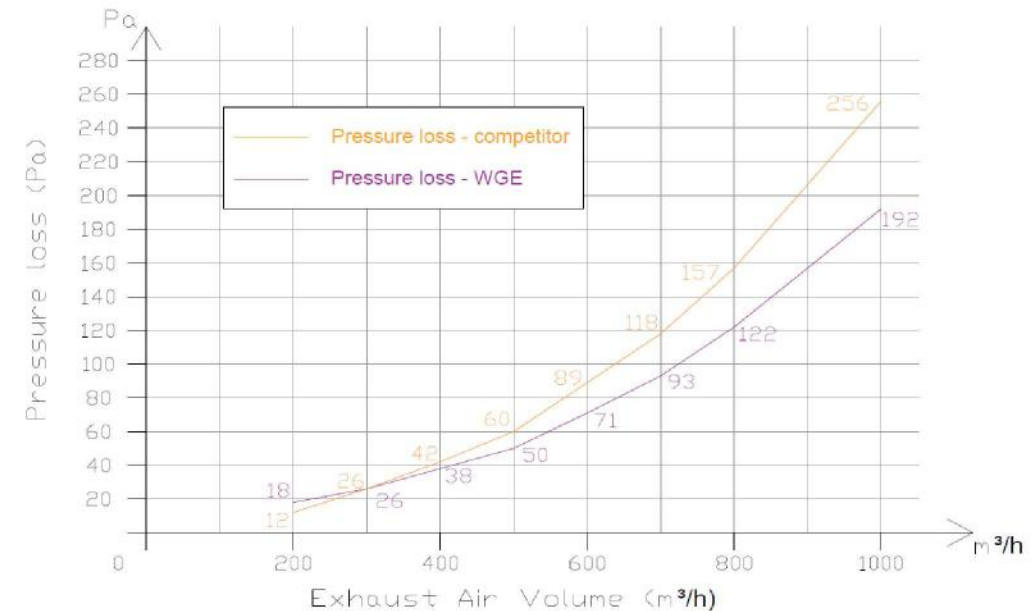


Diagram Pressure loss (200-1000 m³/h)



- Diagram fractional separation shows the effectiveness and better performance with the WGE filtration

- Pressure loss diagram shows the lower energy consumption due to lower pressure losses with WGE filtration

The comparison of the new WGE Filter combination with a competitor shows the advantages in terms of efficiency as well as in terms of pressure loss and energy consumption

12.5 Grease Separation Basics For New Developed WGE Grease Filter System

- Grease particles size arising and entering the hood are depending on the type of cooking / frying process.
- With very hot cooking processes such as grilling and deep frying, particles with a size of 0,5 – 2,0 microns are formed.
- On average, about 80% of the grease particulates produced during cooking are in the range of about 0,1 - 5 microns in size and need **both**, wire mesh and labyrinth grease filtration.
- For effective filtering, it is extremely important that also particles in the range of 0.1 to 5 microns are filtered out as much as possible with the correct combined filtering system.
- Exhaust hoods that are equipped with a UV system also require perfect pre-filtering, as described before, in order to achieve optimal results in terms of duct cleanliness.
- Without optimal pre-filtering, it is extremely difficult or nearly impossible to achieve satisfactory results in terms of fat reduction in the exhaust air duct.

Without optimal well designed pre-filtering no satisfactory results in terms of fat reduction

12.6 Owners Advantages With WGE New Developed Grease Filter System For Exhaust Hoods

- No electrical or electronically components in grease bearing areas
- No UV System Spare Part Costs (For one Exhaust Connection app. 400 €/year Saving)
- No UV System Maintenance Costs (For one Exhaust Connection app. up to 6 hours per year saving)
- No UV System Energy Costs (For one Exhaust Connection app. 0,4 KW amounts to app. 350 €/year saving)
- Easy Cleaning Of Grease Bearing Areas

The new grease Filter Systems reaches a maximum saving on owners side

13. References (1/2) – Exhaust Hoods In All Variations With And Without UV-C/Ozone Systems

New Building Number	Owner	Shipyard
• NB 657	Royal Caribbean Intern.	Meyer Shipyard
• NB 658	Royal Caribbean Intern.	Meyer Shipyard
• NB 675	Celebrity Cruises	Meyer Shipyard
• NB 676	Celebrity Cruises	Meyer Shipyard
• NB 677	Celebrity Cruises	Meyer Shipyard
• NB 679	Celebrity Cruises	Meyer Shipyard
• NB 691	Celebrity Cruises	Meyer Shipyard
• NB 659	Aida Cruises	Meyer Shipyard
• NB 660	Aida Cruises	Meyer Shipyard
• NB 666	Aida Cruises	Meyer Shipyard
• NB 680	Aida Cruises	Meyer Shipyard
• NB 689	Aida Cruises	Meyer Shipyard
• NB 690	Aida Cruises	Meyer Shipyard
• NB 695	Aida Cruises	Meyer Shipyard

13. References (2/2) – Exhaust Hoods In All Variations With / Without UV-C / New Filter System

New Building Number	Owner	Shipyard
• NB 678	Norwegian Cruise Line	Meyer Shipyard
• NB 692	Norwegian Cruise Line	Meyer Shipyard
• NB 697	Royal Caribbean Intern.	Meyer Shipyard
• NB 698	Royal Caribbean Intern.	Meyer Shipyard
• NB 693	Norwegian Cruise Line	Meyer Shipyard
• NB 694	Norwegian Cruise Line	Meyer Shipyard
• NB 699	Royal Caribbean Intern.	Meyer Shipyard
• NB 711	Star Cruises	Meyer Shipyard
• NB 712	Star Cruises	Meyer Shipyard
• NB 707	Norwegian Cruise Line	Meyer Shipyard
• NB 708	Norwegian Cruise Line	Meyer Shipyard
• NB 700	Royal Caribbean Intern.	Meyer Shipyard
• NB 713	Royal Caribbean Intern.	Meyer Shipyard

Content

Thank you...

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