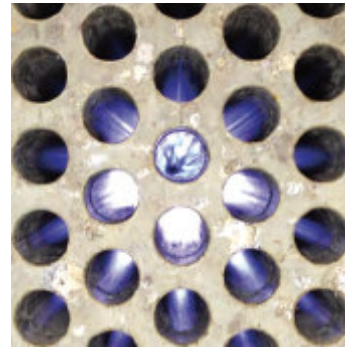


JNW CleaningSolutions®

Experience pays



ACC User Group

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JNW – History / Step Stones

- 1932 Founding of the company Jaresch&Wegner as a cooler manufacture for the automobile industry in Bochum, Germany.
- 1991 Development and production of the first permanent half automatic cleaning system for air heat exchangers
- 1995 Start of the cleaning service with our mobile cleaning teams
- 1998 Founding of the j&w Reinigungssysteme für Trockenkühlanlagen GmbH, Bochum
- 2001 Start of the (ITC) cleaning for air heat exchangers
- 2004 Founding of the JNW CleaningSolutions RSA (Pty) Ltd, South Africa
- 2005 Delivery of the 100. cleaning systems
- 2007 Founding of the JNW CleaningSolutions SARL, France
- 2010 Taking over (Assetdeal) by the Kuwaiti German Holding Company, Kuwait and founding of the JNW CleaningSolutions GmbH, Bochum
- 2010 Founding of the JNW Italia SRL, Italien
- 2011 Delivery of the 250. Reinigungssysteme
- 2011 Founding of the JNW Middle East Ltd., Kuwait
- 2012 Development and delivery of the first programmatically full automatic cleaning system
- 2015 Development of the first programmatically full integrated automatic cleaning system





JNW – Possibilities and Impact of Fouling

ACC finned tubes collect all manner of environmental fouling including:

- Pollen
- Dust
- Leaves
- Insects and bird carcasses
- Plastic bags

Impact of fouling:

- Poor heat transfer
- Higher operation costs
- Higher fan speeds = increased house load
- Reduction in MW output due to turbine backpressure



JNW – Types of Offline Cleaning

Types of Offline Cleaning:

- Fire hose
 - Advantages
 - Zinc friendly cleaning
 - Small size of equipment
 - Disadvantages
 - Low water pressure
 - Use of a scaffolding
 - Low cleaning effect
- High pressure hand lance
 - Advantages
 - Low water consumption
 - Small size of equipment
 - Disadvantages
 - high water pressure will damage the zinc protection of the fins
 - Use of a scaffolding
 - Bending of the fins
 - Low cleaning effect



JNW – Types of Offline Cleaning

Types of Offline Cleaning:

- Foam or chemicals

- Advantages

- Less damage to the fins
 - Small size of equipment

- Disadvantages

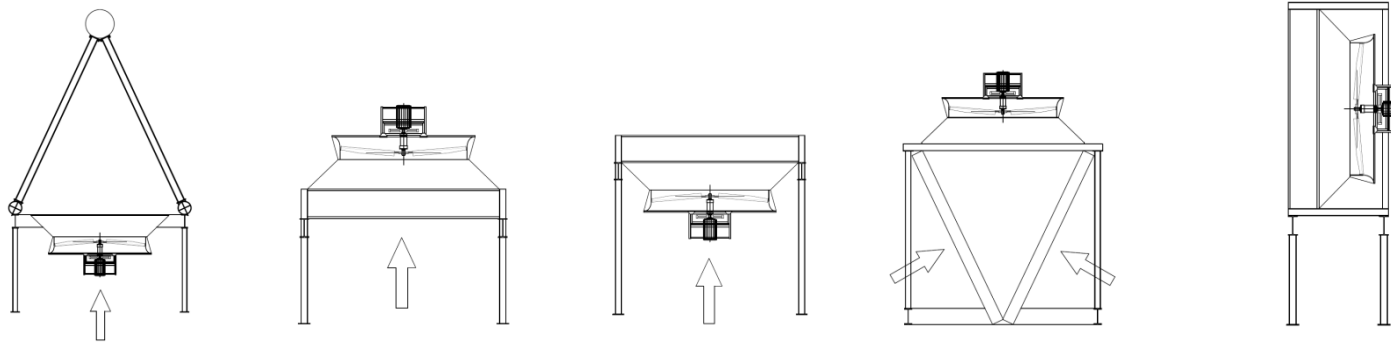
- Chemicals which are used mostly not environmental friendly
 - If the foam dries out too fast, making it difficult to totally flush through
 - Using chemicals is a potential risk for the employees they are working with these
 - Use of a scaffolding



JNW – Cleaning Equipment Features

The cleaning systems and processes developed and designed by JNW German engineering adapt to the individual design of your heat exchanger and clean all shapes:

- Air Cooled Condenser / ACC
- Flat Bed Cooler
- Fin Fan Cooler
- V-Design
- Hybrids
- Natural Draught Cooling
- Tower / Heller System



JNW – Online Cleaning Equipment

- Typ: JNW LCS – HA
Semi automatic cleaning system
- Application
 - ACC roof
- Technical Details
 - Every roof side of the ACC will get a cleaning chassis with high pressure hoses incl. a movable nozzle beam.
 - The vertical movement of the nozzle beam will be executed by an electric driven tooth belt.
 - The controlling of the nozzle beam will be done by a mobile control panel.
 - The horizontal movement of the system will be executed manually by the operator.
 - Pressure: 50 / 80 bar
 - Water Consumption: 135 - 270 l/min
depending on the technical requirements



- Video Half Automatic

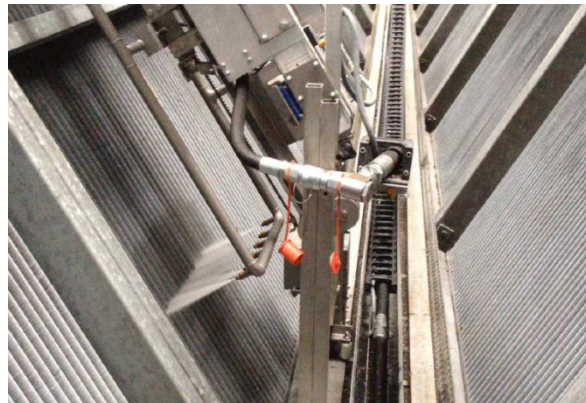


JNW – Online Cleaning Equipment

- Typ: JNW LCS – VA
Full automatic cleaning system

- Application

- ACC roof



- Technical Data

- The full automatic system has instead of the half automatic system also an automatic horizontal movement.
- The controlling of the total cleaning system will be executed by the operator with the movable control unit.
- Chassis could be delivered as non-walkable and walkable version.



➤ ***The one and only full automatic cleaning system in the world***

JNW – Online Cleaning Equipment

- Typ: JNW LCS – IVA
Full integrated automatic cleaning system
- Application
 - ACC roof
- Technical Data
 - The full integrated automatic system is instead of the full automatic system (island solution) fully integrated in controlling of the ACC.
 - The controlling of the full integrated automatic system will be executed by the operator in the control center.
 - No personal on the ACC platform needed to operate the system.



➤ ***The one and only full automatic cleaning system in the world***

- Video Full Automatic System



JNW – Key Features of different Cleaning Solutions

Half automatic cleaning system vs. any offline cleaning system:

- Optimized nozzle design (fan beam parallel to the cooler fins).
- 100% of cooler area will be cleaned.
- Continuous speed = steady cleaning by means of drive motor.
- Three different cleaning speeds for different grades of fouling.
- Online cleaning during operation: only shut down of one section instead of the complete roof.

Advantages of a full automatic cleaning system vs. half automatic cleaning system:

- Increase of safety.
- No manual work of operators.
- Full automatic cleaning of each roof during one shift or depending of roof size.
- Operator only starts the cleaning progress once in the morning and stops it at the end of the shift. During the shift maximal visual inspections are necessary from time to time.

Advantages of a full integrated automatic cleaning system vs. full automatic cleaning system:

- No manual work on the ACC platform
- Cleaning progress can be started from the control center
- Cleaning of parts of the cooler depending of the fouling grade



JNW – Cleaning Service Features

- 2 man team plus equipment
- Flexible work
- Equipment is easy to carry
- We come, we clean, we leave
- Quick and reliable service
- Same cleaning quality as a fixed installation
- What we need is only:
 - Potable water supply /
Process water supply (2.5 Bar)
 - Power supply (63A)



JNW – Online Cleaning Service Features

- The Clean solution for a long service life of your heat exchanger.
- Cleaning with the JNW Cleaning System is not only thoroughly but also extremely gentle.
- Perfect cleaning of fine tubes by a nozzle beam optimally adapted to the bundle geometry and an optimized volume of water
- Zinc – friendly cleaning with optimized pressure
- No bending of fins (steel, brass, copper)
- Cleaning can be performed during ongoing production



- JNW CleaningSolutions develops together with the customer feasibility studies.
- The result of this close relationship between customer and JNW is shown in the following example, which shows in detail the efficiency after cleaning.

before...



after!

➤ ***JNW – Clean Results are our Strongest Arguments***

24% increase Δ -T at half fan capacity

- Industry: Refinery
- Country: Germany

Improvement: Increase in Yield
Decrease in energy costs
Reduction in CO₂ emissions

Temperature before cleaning:
Inlet: 89.1°C, Outlet: 62,0°C,
 Δ -T: 27,1°C

Temperature after cleaning:
Inlet: 87.6°C, Outlet: 53,9°C,
 Δ -T: 33,7°C

Result: Half of the fans could be switched off after cleaning with JNW equipment



➤ **Refinery: Huge savings after cleaning**

JNW – Feasibility Studies

Turbine back pressure in a
german power plant:

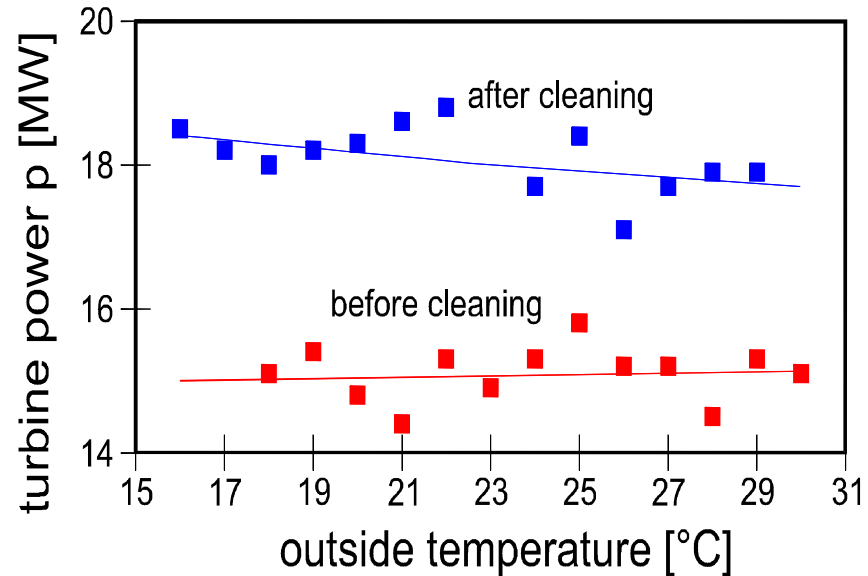
-before cleaning 130 mbar
-after cleaning 100 mbar

8 mbar = 1 MW = 45 Euro

30 mbar = 3,8 MW

3,8 MW x 45 € x 7 days x 24h x 75% operation time = 21.546 €/ week

and 1.120.392 €/ year



➤ **400 KW Power Plant: 1.1 Million saving per year**

Improvements in various plants across Europe:

WVA Bonn	Flat bed cooler	fan speed	50%
MVA Hamburg	Flat bed cooler	fan speed	50%
HKW Kaiserstuhl	ACC	turbine wattage	20%
Stadtwerke Münster	ACC	Pressure	29%
WKC Eindhoven	ACC	fan speed	50%
WKC Bergen	ACC	fan speed	50%
WKC Heinecken	ACC	fan speed	50%
DSM Geelen	ACC	Pressure	47%
OMV Burghausen	ACC	steam quantity	24%
OMV Burghausen	Flat bed cooler	fan speed	50%
WKC Enschede	ACC	fan speed	50%
Egger Spanplatten	ACC	steam quantity	25%

ROI of the cleaning will be only a matter of days!

➤ *Cleaning will improve your profit*



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Together we achieve more

MAXIMUM SYNERGY

for a BETTER PERFORMANCE

