KTW AirFlowSaver (Kit)

Save Energy and Increase Performance
of Compressed Air Applications

Revolution in Compressed Air Technology - save energy and increase performance with the KTW AIRFLOWSAVER (KIT)

- Despite high energy costs, compressed air (CA) is an integral part of modern production plants
- Legal and social developments call for the reduction of energy consumption and CO_2 emissions
- Many companies strive to reduce the energy consumption of their compressed air systems
- **Optimization of CA consumption** must be made **before** optimizing CA generation and distribution takes place
- The KTW AIRFLOWSAVER **reduces CA consumption** while **increasing the blowing force** by converting continuous air flows into sharp and powerful pulses
- Industrial applications show significant **savings potentials** of **60% - 95%**
- Investments in KTW AIRFLOWSAVER show **paybacks (ROI) < 1 year**
- In many countries, national funding programs are established to provide financial incentives to foster the use of energy-efficient technologies (e.g. BAFA in Germany)
- In addition to a system **purchase**, we also offer a **rental** option for our products

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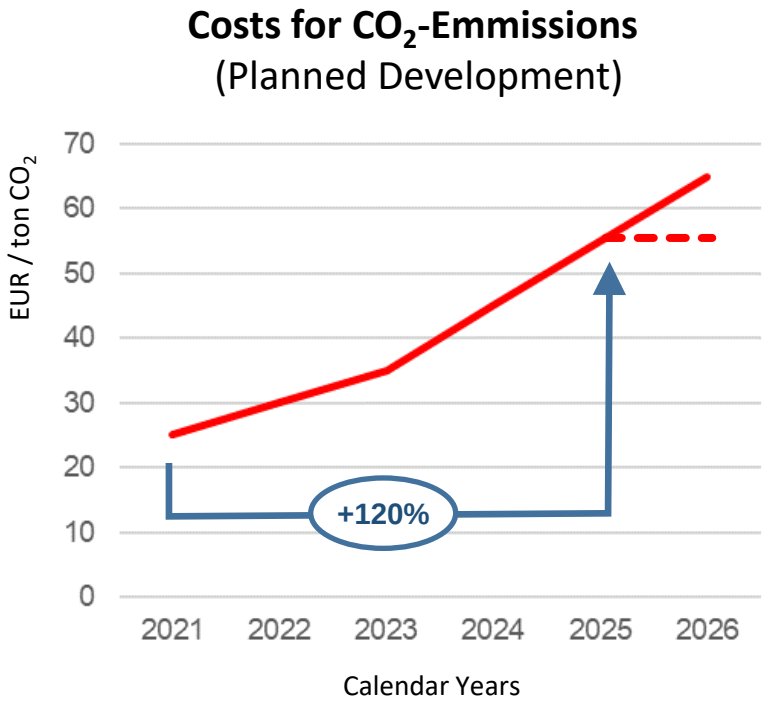
Status Quo of today's compressed air applications

- In many modern production systems, CA is valued as a flexible and easy-to-use source of energy which is, despite high energy costs, indispensable in many applications
- More and more political (CO_2 tax from 2021) and social (UN SDG, DIN ISO 50001) initiatives call for a **sustainable use of resources** and/or the reduction of CO_2 emissions
- Many companies are launching projects to reduce energy costs by increasing the efficiency of their CA system. Those projects usually focus on where the costs arise: on the generation side, the compressor room, e.g. by modernization of compressors
- It is often overlooked that the first step must always be to **optimize the consumption** of CA **at the Point of Use**, the CA application
- Smart technology, as the KTW AIRFLOWSAVER, helps to significantly reduce the demand for CA in existing applications. It forms the basis for an optimized (re-) dimensioning (down-scaling) of the entire CA system without overcapacities or over-compressing

SDG – Sustainable Development Goals der UN Agenda 2030

From 2021, energy consumption in Germany will be taxed according to CO_2 emissions of the energy source used (CO_2 tax)



- Taxation according to the Fuel Emissions Trading Law (BEHG)
- Energy producers acquire emission allowances and pass on costs to consumers
- The decisive factor is the energy source used (the higher the CO_2 emissions during production, the higher the CO_2 price)
- Development of CO_2 prices planned until 2025, from 2026 price formation via auction procedures
- Financial incentive to reduce energy consumption and use climate-friendly energy sources through lower CO_2 prices
- Key measure to achieve climate neutrality by 2050

Sustainable use of resources and energy efficiency are the main goals of many political and social initiatives

United Nations Agenda 2030

Objectives:

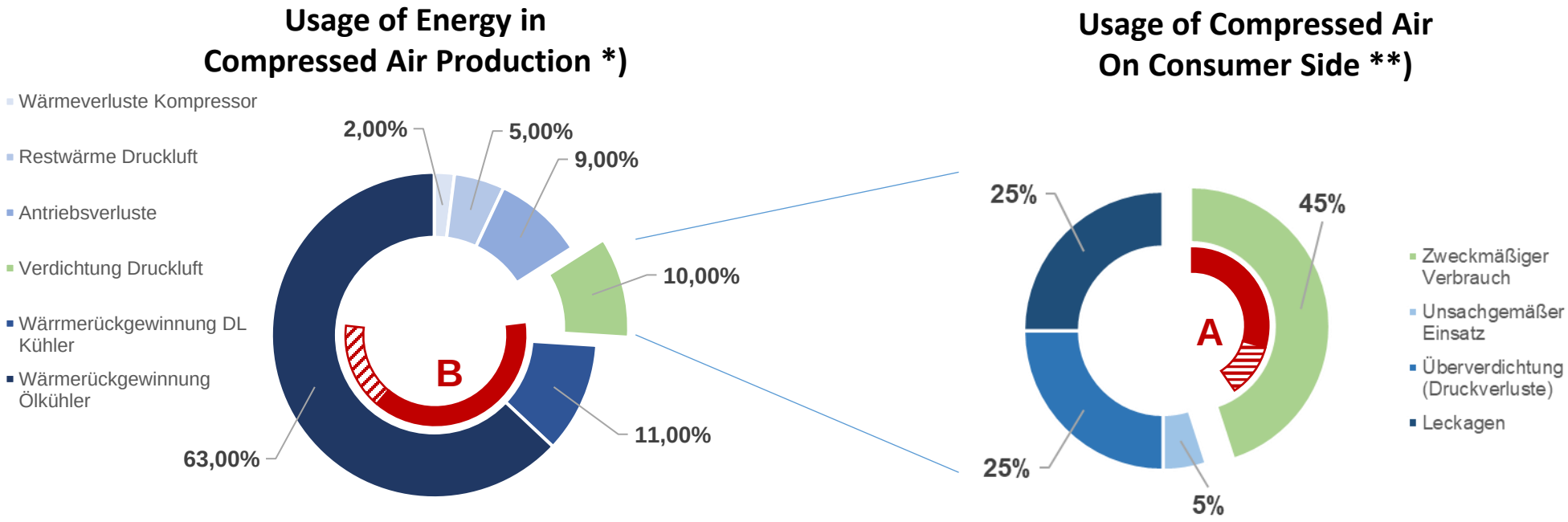
- Boosting economic growth
- Reducing disparities in the living
- Creating equal opportunities
- **Sustainable management of natural resources**

Certification of Energy Management System

Objectives:

- Systematic recording and implementation of technical measures to increase energy efficiency
- Prerequisite for partial exemption from the EEG levy and in the future from electricity/energy tax

Reducing energy costs by optimizing the consumer side of compressed air systems



- On the generation side, only 10% of the energy is converted into compressed air
- On the consumer side, only 45% of compressed air is used properly
- A **reduction of required compressed air** by 60%-90% (**A**) ***) leads to a **reduction of total energy demand** by approx. 30%-55% (**B**) ****)

Source: *) ISI **) Boge Druckluftsysteme ***) Range of realized savings in comparable projects of KTW Technology GmbH ****) Calculation by KTW Technology, Assumption: reduced consumption leaves losses unchanged, proportional energy reduction

The KTW AIRFLOWSAVER aims to optimize more than 70% of all compressed air applications

*- Categorization of Compressed Air Applications *) -*

Category	Usage	Frequency
Pneumatics	e.g..: - Drive of tools, etc. - Control air for valves, flaps, etc.	20%
Manipulation	z.B.: - Conveyor air - Transport of materials - Accelerating material - Irradiation of surfaces - Cleaning, blowing, dedusting	70%
Process	z.B.: - Integration into chem. process - Drying, cooling, aeration	
Vacuum		10%
Testing		

Potential optimization for more than 70% of all CA applications:

- **Reduced volume flow** due to transition from continuous to pulsed flow
- **Increased force** of the pulsed flow compared to the continuous flow
- Reduced process time due to **extremely short reaction times** and switching cycles

Note:
similar effects can be achieved in applications with water, oil, etc. as switched medium

Source: *) Innovationsallianz Green Carbody Technologies, 2013

Financial benefits of the KTW AIRFLOWSAVER become visable immediately (ROI < 1 Year *))

- **Reduced compressed air consumption** (depending on application from 60% to 95%, proven in industry applications)
- **Reduced total energy demand** and correspondingly **reduced CO_2 emissions** of the company
- **Improved process quality** due to increased pulse force (pulsed beam is about 15-20% stronger than a continuous flow)
- **Down-scaling** of the compressed air system and avoidance of unnecessary investments
- Reduced plant costs for operation, maintenance and maintenance
- **Long service life** of the solenoid valve (>3 billion switching cycles) due to low-wear and maintenance-friendly design
- **Increased plant availability** due to high reliability and low risk of failure
- Investments in energy efficiency-enhancing technology are eligible for **public funding** in many European countries (e.g. in Germany by BAFA **))

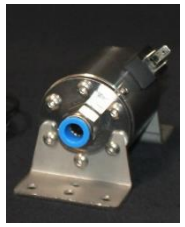
*) ROI – Return on Invest **) BAFA – Bundesamt für Wirtschaft und Ausfuhrkontrolle

The KTW AIRFLOWSAVER can be easily adapted to almost any application

- **Holistic** system solution with configurable function and delivery
- **Maximum system performance** due to fine-tuned mode of action of the individual components
- **Simple**, distributed **assembly** of the components, taking into account spatial conditions
- Operation as a **self-sufficient** or **integrated system**
- System **scalable** in throughput and force over number and size of valves
- Operating mode can be adjusted and changed via variable parameters in the system controller
- **Communication** with the system via intuitive software (USB interface) or CAN bus

Functionality of the KTW AIRFLOWSAVER can be tailored to the specific requirements of the application

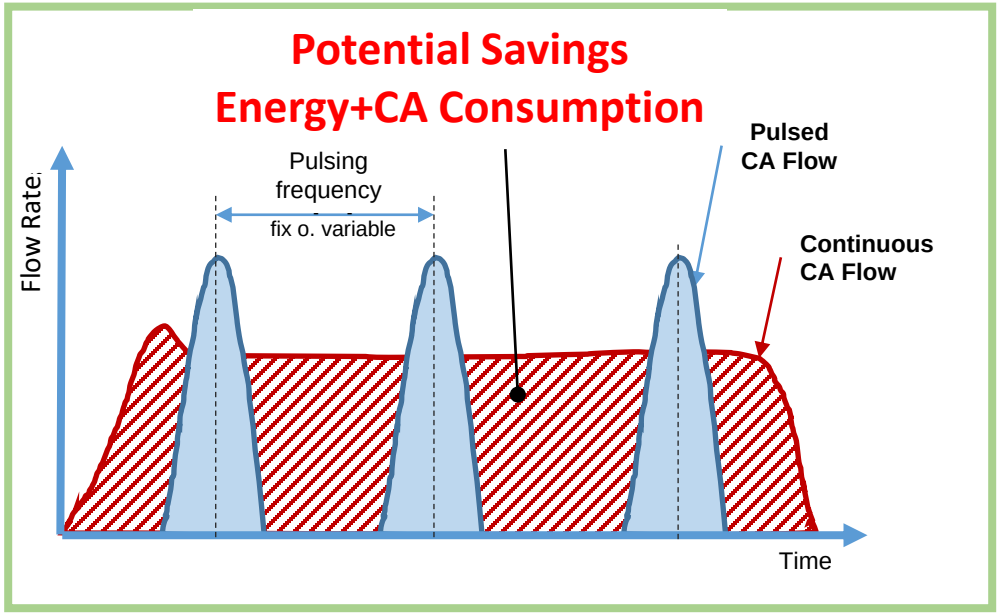
KTW AIRFLOWSAVER (Kit)

	Control box/ E-Box	Valve Controller	Solenoid Valve	Sensor	Shaping/ Forming	Installation Aid
Components						
Function	- If cannot be integrated elsewhere - Power Supply - Fuses - Filtering	- Control of one or more valves - Setting parameters - Mounting on hat rail - Communication	- Switching of air flow (on/off) - Fast-switching - Powerful pressure pulses - Valve sizes depen-dent on flow rate	- Detection of switching time - Start/Stop-Event - Trigger signal to valve controller - Application dependent	- Guiding and forming - Noise reduction - Use of all nozzle shapes and types - Application specific. design	- Application specific mounting frame - Standard mounting frame e.g. for transport belts
Scope	**Core Functionality** Optimized performance by fine-tuned components					
	Optional Functionality					

Note: the system is designed for an operating pressure difference between 1-8 bar, power supply 240V

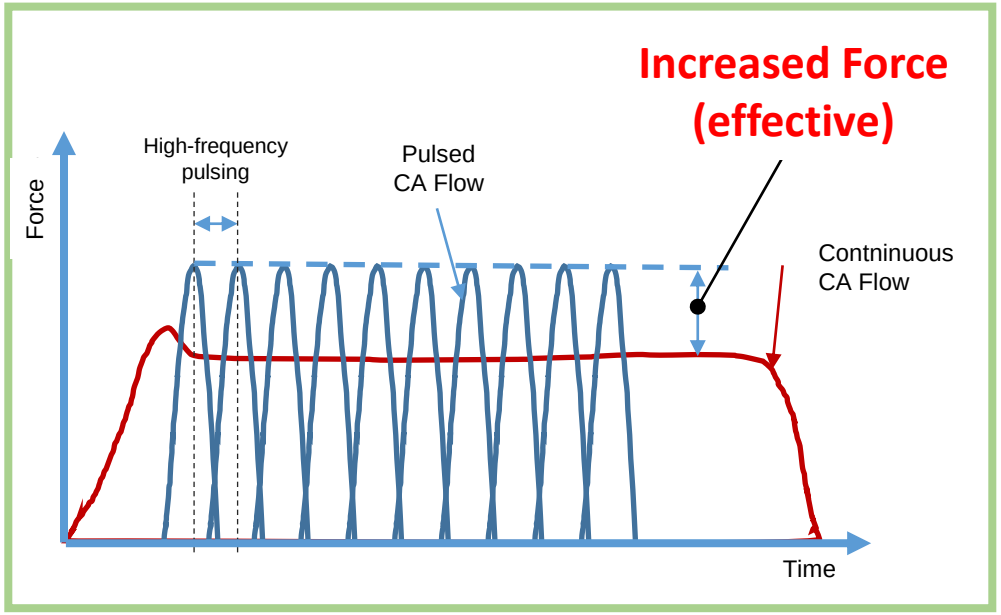
The KTW AIRFLOWSAVER reduces the consumption of compressed air and increases the force of the jet

A) Reduced Consumption



+ time limitation of air flow (pulse)
+ Pulse only when needed
+ Avoidance of "wasted" compressed air

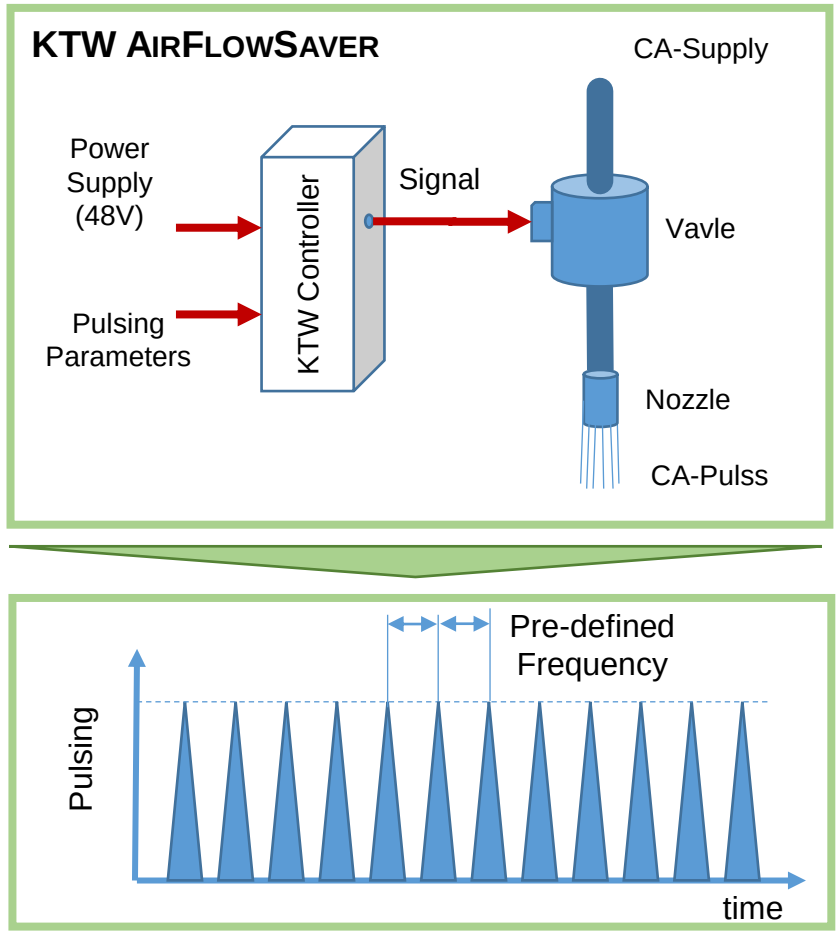
B) Increased Strength



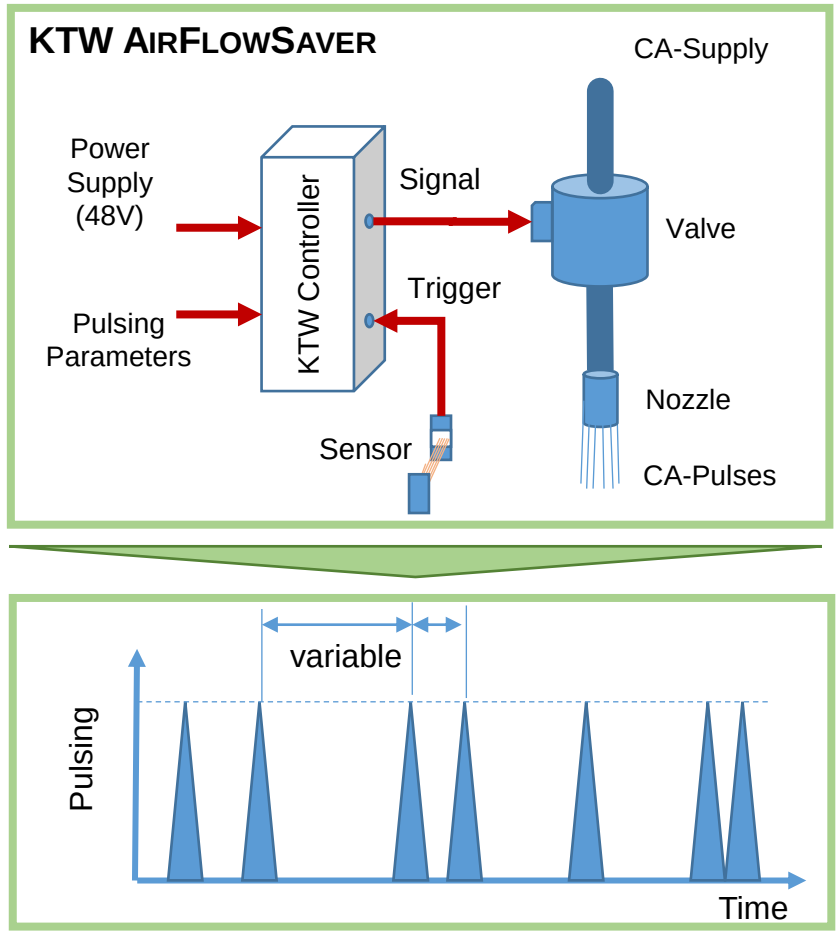
+ Short force increase when opening the valve
+ Exploitation by high-frequency repetition
+ Increase in the effective force of the compressed air flow

Pulsing can be done regularly or event-controlled, e.g. initiated by a sensor

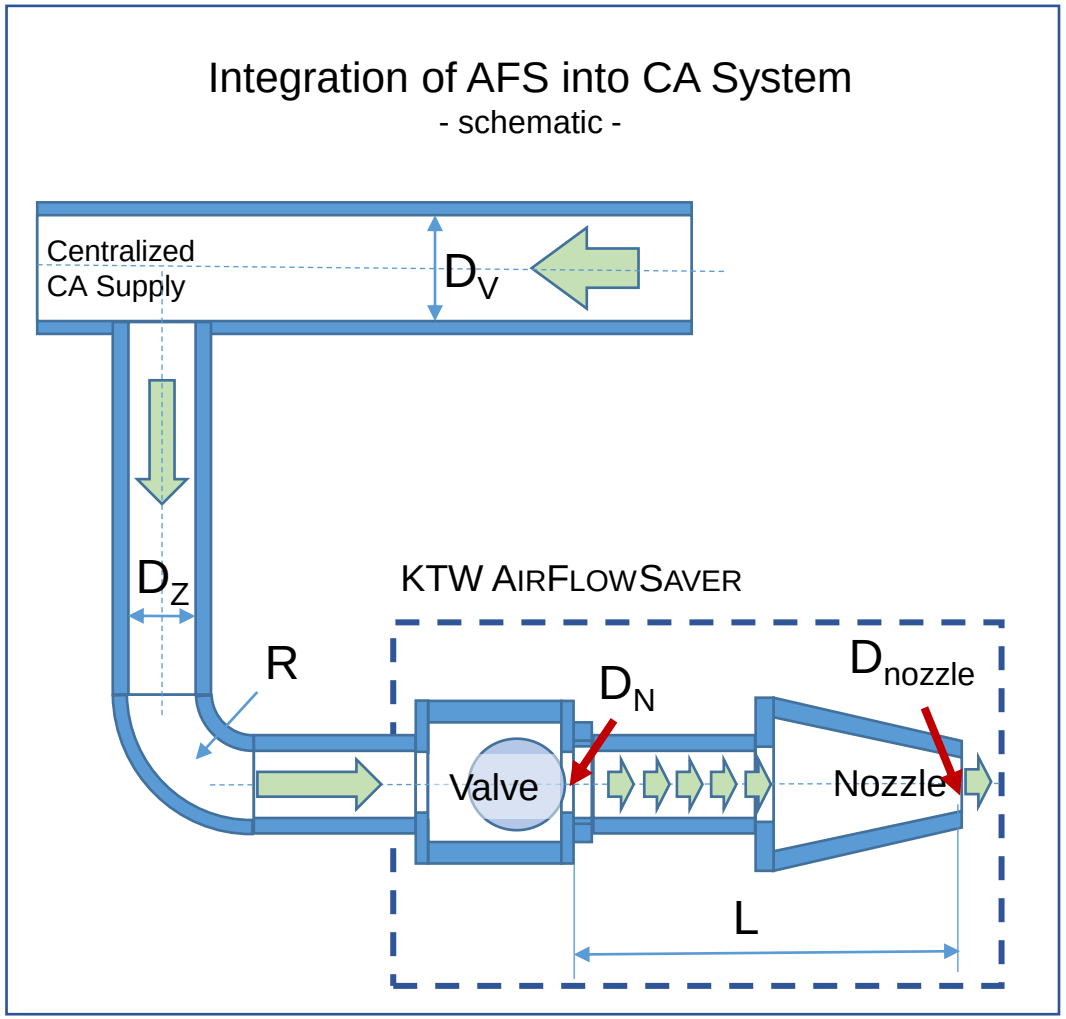
A) Regular Pulsing



B) Event-controlled Pulsing



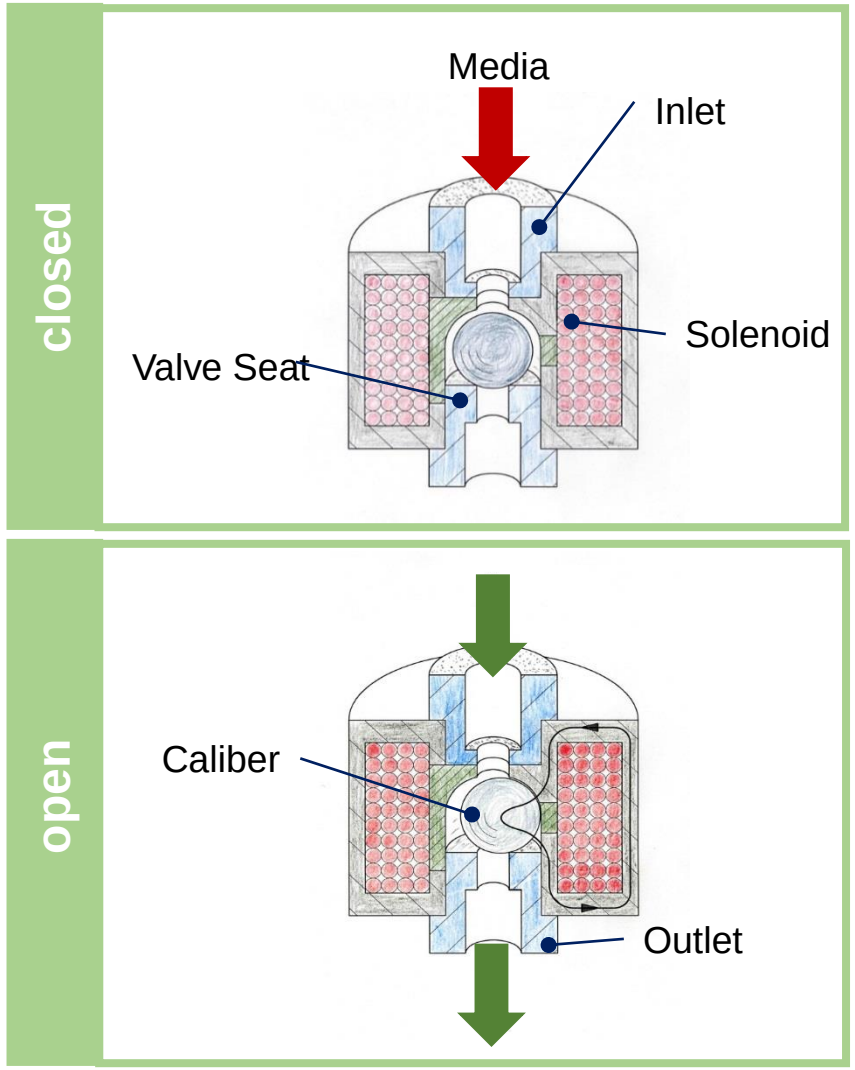
The cross-sections of the KTW AIRFLOWSAVER and the compressed air supply lines should be aligned



Maximizing performance of the KTW AIRFLOWSAVER requires consideration of the following aspects:

- Adjustment of the nominal diameters in the system ($D_N < D_Z < D_V$)
- Use bent radii as large as possible (inlet and between the valve and nozzle)
- No 90° angle between valve and nozzle
- Position of the valve close to the application (L < 15 cm, max. 30 cm)
- D_{nozzle} should correspond approximately D_N, i.e. beam forming, no further compression in the nozzle
- Installation orientation (vertical, horizontal) freely selectable. Valve closes in case of pressure difference.

KTW SmartValve Technology stands for maximum performance, long service life and minimum wear

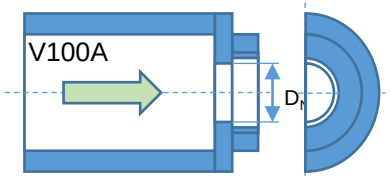
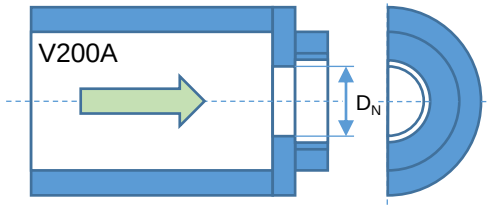
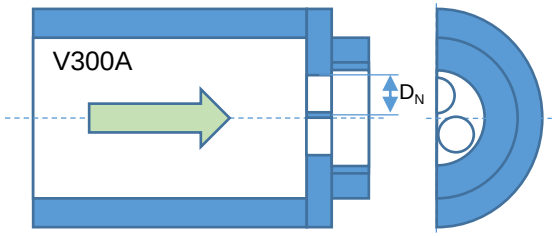
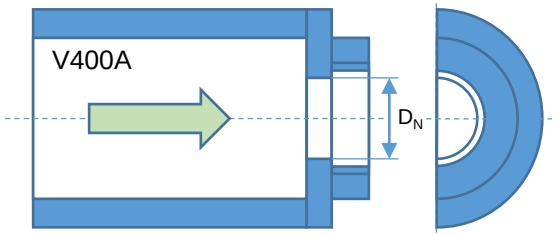


KTW SmartValves build the basis of the KTW AirFlowSaver

- Low-wear, maintenance-friendly design
- Hardly moving parts (caliber)
- No tiring reset elements
- Valve open without pressure
- Medium flows around caliber
- Pressure difference closes valve
- Magnetic field pulls ball from seat
- High tightness due to polished caliber/ valve seat pairings (stainless steel)

Note: in order to avoid damage to the contact surface between caliber and valve seat, it is recommended to use a particle filter

The performance of the KTW AIRFLOWSAVER can be scaled by the help of four valve sizes

System	Valve Size	D_N [mm]	Q_N [mm²]	Flow Rate max. [m³/h] *)	Force	Speed
AFS-100		1,0 – 3,0	0,8 – 7,0	~ 14		
AFS-200		2,0 – 5,0	3,1 – 19,6	~ 30		
AFS-300		(3x) 2,0 – 5,0	6,7 – 58,8	~ 85		
AFS-400		3,0 – 7,0	7,0 – 38,5	~ 75		

*) measured with CA at 20° C and 6 bar pressure difference

The flow rate of the KTW AIRFLOWSAVER is determined by the nominal diameter in addition to the valve size (1/2)

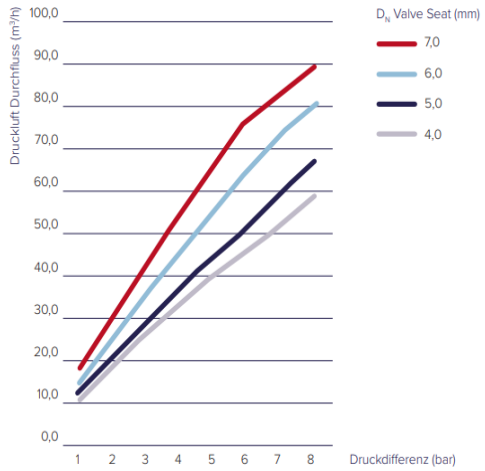
100% Open

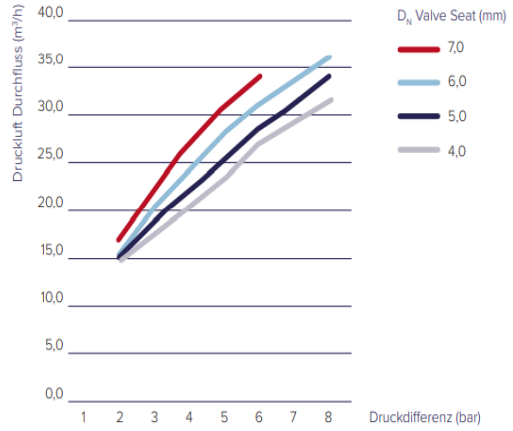
Pulsed Operating Mode

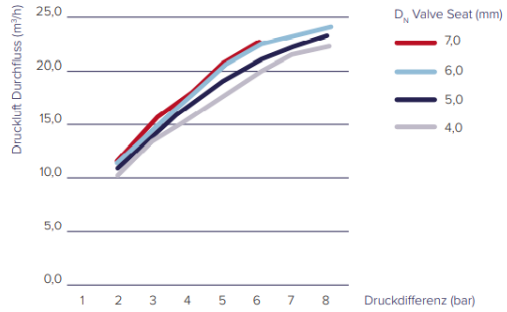
50% Open 50% Closed

30% Open 70% Closed

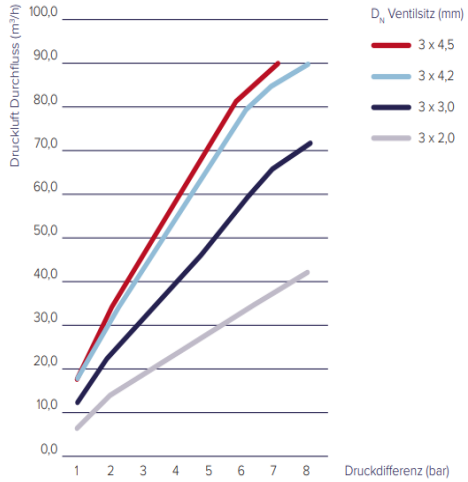
AFS-400

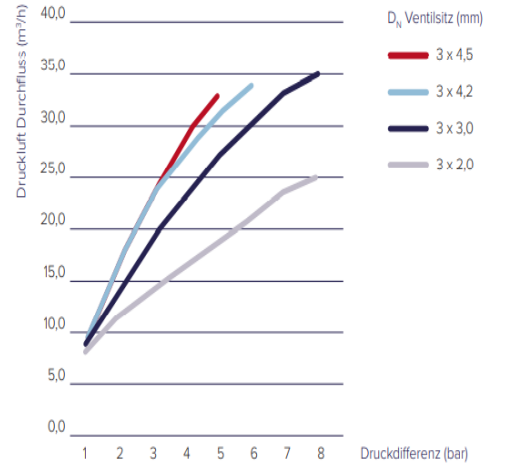


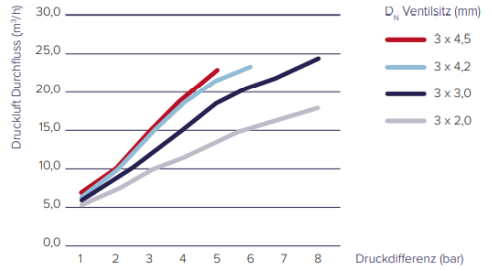




AFS-300







The flow rate of the KTW AIRFLOWSAVER is determined by the nominal diameter in addition to the valve size (2/2)

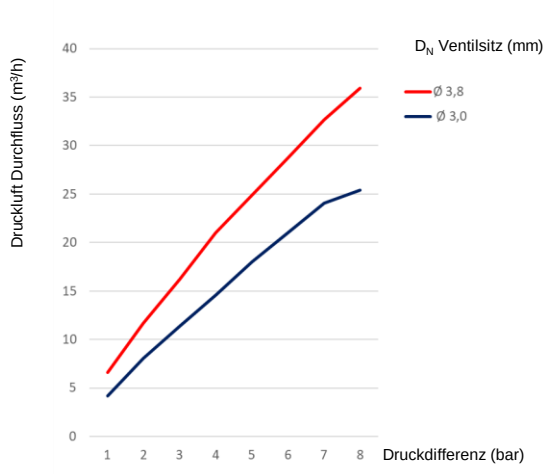
100% Open

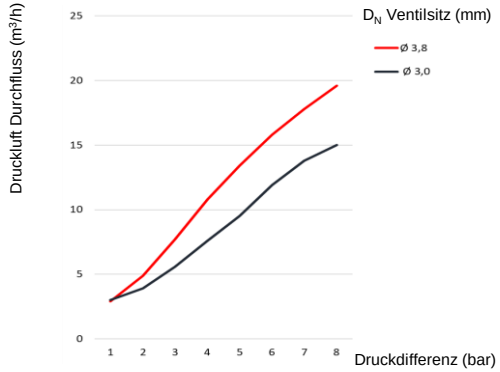
Pulsed Operating Mode

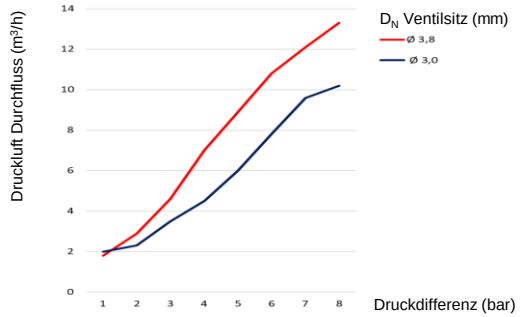
50% Open 50% Closed

30% Open 70% Closed

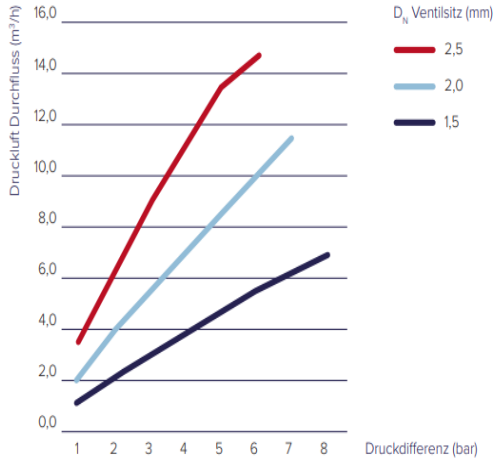
AFS-200

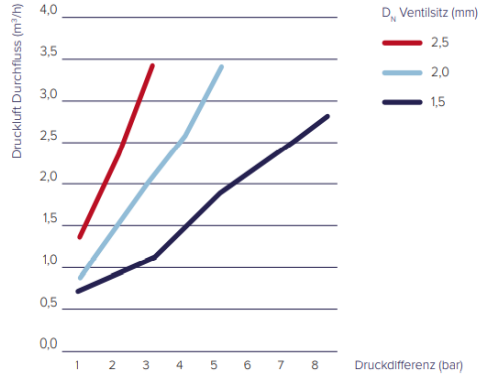


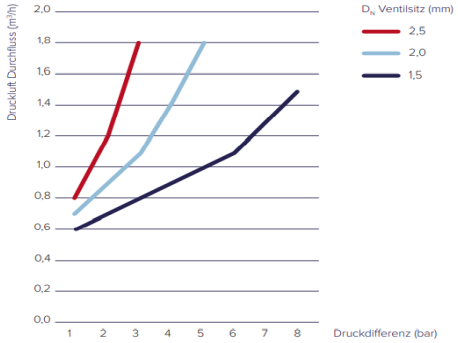




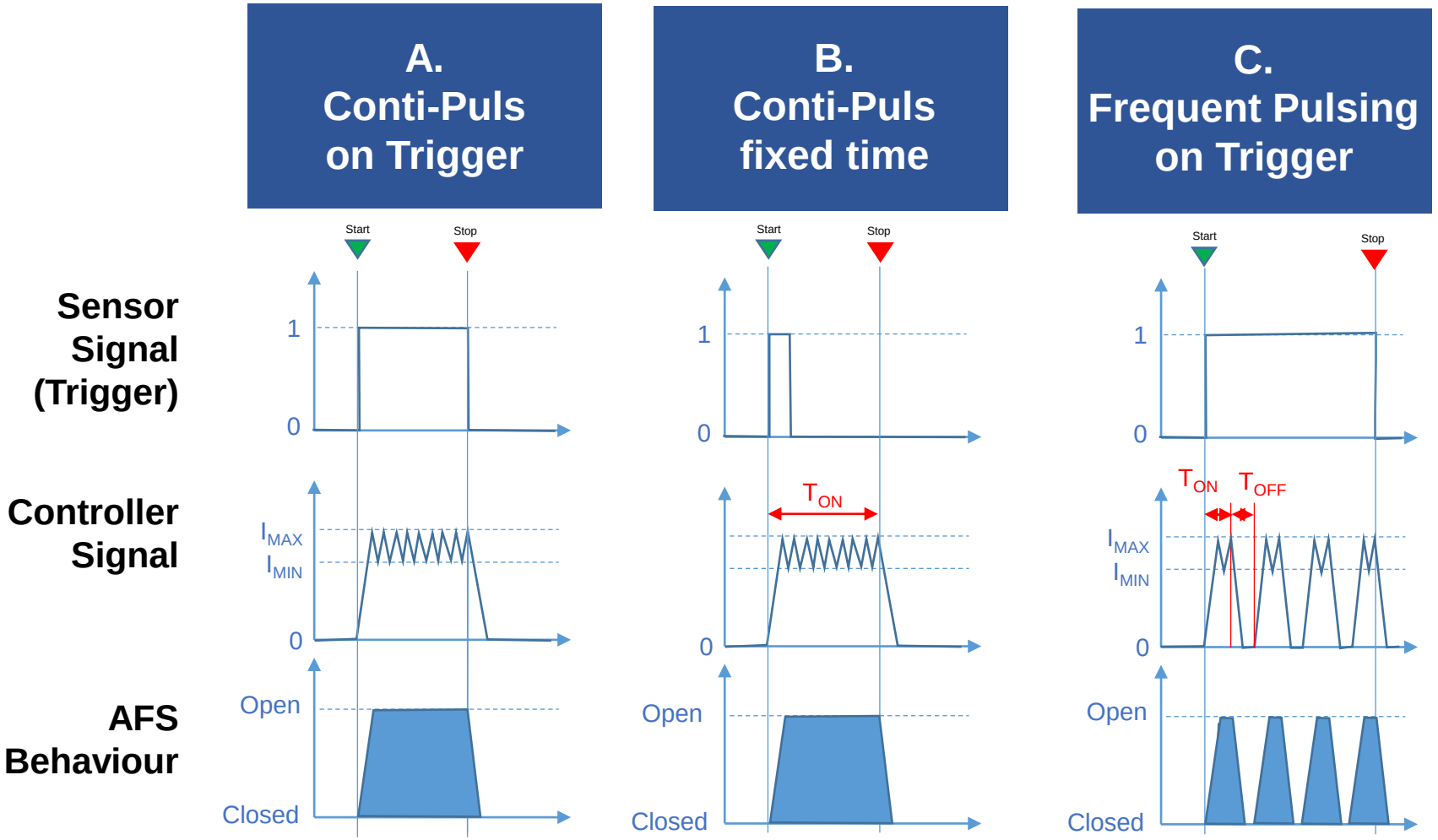
AFS-100







Three Operating Modes are available to control behaviour of the KTW AIRFLOWSAVER



The intuitive software allows setting of the operating parameters of the KTW AIRFLOWSAVER on the controller

Parameter	Symbol	Meaning	Comment
Operating Mode		Selects one of the three operating modes	Refer to page 19
Opening Current	I_{MAX}	Leads to deflecting the calibre from the valve seat and thus opens the valve. Required current depending on the medium and pressure difference. (rule of thumb: I_{MAX} = pressure difference + 2A	The higher I_{MAX} the faster the valve opens. If too low, the valve reacts to slow or does not open at all. Max. current = 12A
Holding Current	I_{MIN}	In pulse mode, current alternates between I_{MAX} and I_{MIN}. At holding current, valve is at least not just closed. Depending on the medium and pressure difference. (rule of thumb: 2A below I_{max})	If I_{MIN} to high, valve does not close or reacts to slow. Negative impact on repeatability possible.
„Open“-Time	T_{ON}	“Electronic” Open Time of the valve. During this time controller applies current to the solenoid. The “real” Open Time of the valve can differ.	Minimum duration cannot be carried forward
„Closed“-Time	T_{OFF}	Time limit in which the valve should be closed. The real duration may differ from that (refer to T_{ON})	Alternative to frequency. Determines with T_{ON}, the target cycle time

BAFA funding of investments available to improve energy efficiency

Initiative: „Bundesförderung für Energieeffizienz in der Wirtschaft - Zuschuss Modul 4 – Energiebezogene Optimierung von Anlagen und Prozesses“

Funding target:	Process and process changes to efficient technologies and energy optimization of production processes Such as use of energy-efficient plants/machines or replacement of individual components
Eligibility :	proven saving of energy or reducing fossil fuel consumption Energy-reducing measure can also work by increasing output Payback period without funding must be more than 2 years New acquisitions may also be eligible (dep. availability of alternative, inefficient solutions)
Max. Funding:	max. 10 Mio. EUR per project Funding rate max. 40% Funding measured by energy saving (tons of CO2 saved annually) Max. amounts to EUR 500,- per ton of CO2 (for SMEs's EUR 700)-

Pre-requisite for application:

Savings concept, created by energy consultants
iso 50001 certification also allows company-created concept

Payment is made after implementation and proof of savings

Source: Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)

To use the KTW AIRFLOWSAVER, we offer our customers two alternative options

A) System Purchase

- Fixed price offer, by price list and functionality
- Complete range of functions possible
- Transfer of ownership with delivery
- Full exploitation of the entire savings effects
- Wear parts and services as required and ordered

If you are interested, we are happy to provide you with your personal quote!

B) System Rental

- Rental costs depending on defined savings potentials and contract duration
- Contractual minimum term
- No transfer of ownership
- Functionality limited to core functionality (standard)
- Annual advance payment of the rent
- Rental option includes required wear parts / excl. on-site services
- Free return after contract termination, unless repairs are required

Industry Example: Workpiece drying/cleaning in automated CNC production line

Customer:
- Internationally active group
- Supplier to the automotive/aeronautical industry
- Cutting processing of metallic components
- approx. 80 processing centers at site

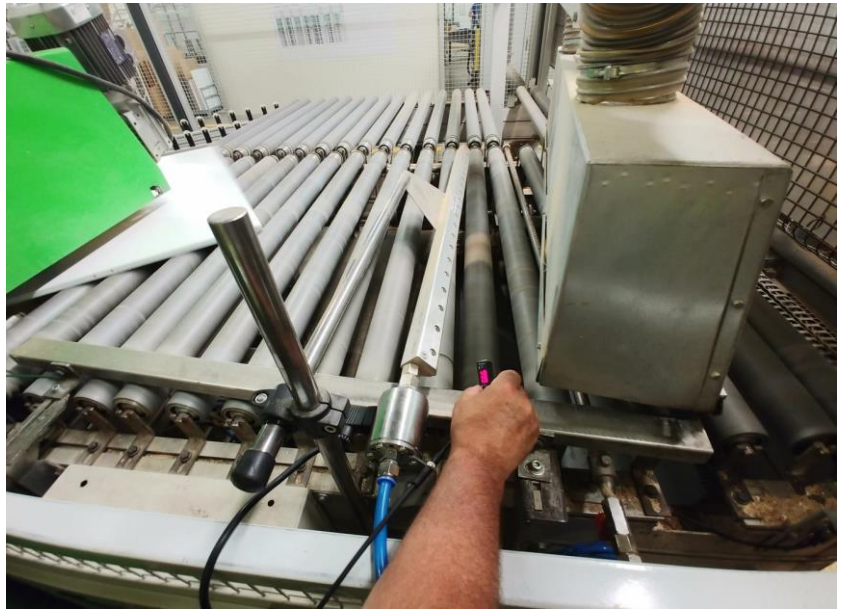
Application:
- Automated-chained Several machining centers with automated material transportation and intermediate blow-off stations
- Cleaning/drying of workpieces
- Removal of coolant / chips after machining
- Portal with vertical-directed air knife

Optimization Approach:
- Limitation of the air flow to the presence of a workpiece (sensor detection)
- Increase in the cleaning effect due to several (approx. 50) pressure pulses per workpiece
- Use of the existing air knife

Benefits achieved *):
- Shortening the blow-off period from 60 sec to 5 sec with the same cleaning effect
- Reduction of compressed air consumption of 1000l/min. to 50l/min. (-95%)
- Savings potential of EUR 3,000/anno and blow-off station

*) Confirmed proof of real savings under the scope of an energy audit

Industry Example: Blowing off the saw/cutting edges of wooden panels before further processing



Customer:
- Internationally operating group
- Large production site in Poland (saw and furniture factory)

Application:
- Automated processing of wooden panels, machines linked via material transportation system
- After cutting, the cutting edges are reglued
- Required removal of sawdust/wood dust before glue application
- Irradiation via two air knives from above and below

Optimization approach:
- Limitation of air flow to the presence of a wooden plate/cutting edge (sensor detection)
- Increase cleaning effect by changing from continuous to pulsed airflow
- Use of the existing air knife
- KTW AIRFLOWSAVER with two valves for operating two air knives

Improvements achieved *):
- Reduction of compressed air consumption of both air knives ~91.6%
- Annual savings of EUR 15,000 per blow-off unit

*) Confirmed proof of real savings under the scope of an energy audit

Industry Example: Surface drying of drink packs before EXP printing

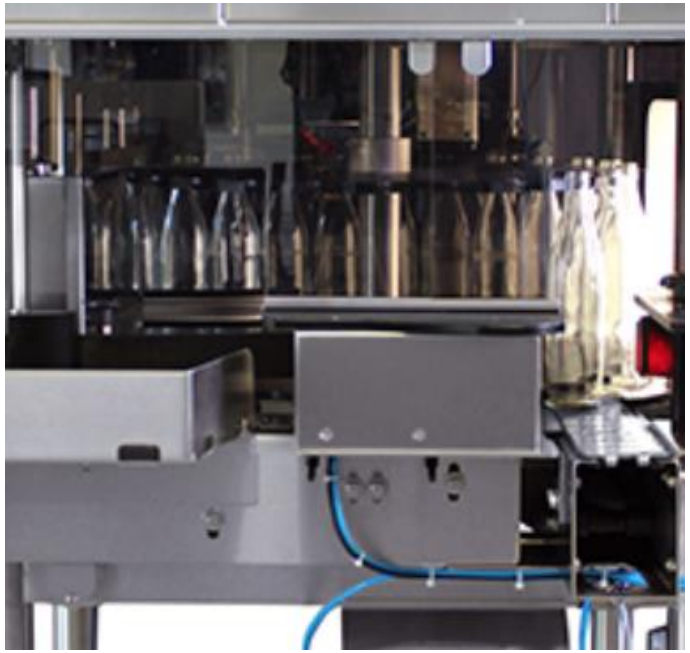
Customer:
- Large Chinese Food Producer
- Filling of beverages + dairy products on numerous production lines
- Operates 30 fast (8 packs/sec.) and 50 slow (3 packs/sec.) filling lines

Application:
- cold filling of drinks in drink packs leads to condensing water on the surface
- Before printing the expiry date partial drying of the surface is required
- Transport of drink packs with distance, speed depending on the performance of the filling machines

Optimization Approach:
- Limitation of the air flow to the presence of a drink packs (sensor detection)
- Limitation to printing area (offset to sensor signal)
- Focusing the air jet by flat jet nozzle

Improvements achieved:
- Savings potential depends on line speed
- Annual saving: 166,400 m^3 per slow line; 112,320 m^3 per fast line
- Reduction of energy costs by EUR 120,000 p.a. across all lines

Industry Example: Bottle drying before ground inspection in bottle inspector



Customer:
- Owner-managed beer manufacturer in Baden-Württemberg with large product portfolio
- Sustainable handling of production resources as an entrepreneurial task understood

Application:
- Fully automatic inspection of empty bottles for residues and damage before filling
- Optical procedures require dry, clean surface
- Blow/drying the bottom of the bottle from below via short air knife
- Forced-guided transport through the plant

Optimization approach:
- Limitation of the air flow to the presence of a bottle (sensor, for empty positions)
- Short, sharp pressure pulse (offset to sensor signal)
- Use of the existing air knife

Improvements achieved:
- Reduction of compressed air consumption by 83.5% (from 31,017 m^3/anno to 5,113 m^3/anno)
- Annual savings in energy costs of approx. EUR 680 per blow-off station
- Amortization in less than 2 years, even in the case of small consumption quantities

Industry Example: Blowing off adhesions after cleaning of bottles

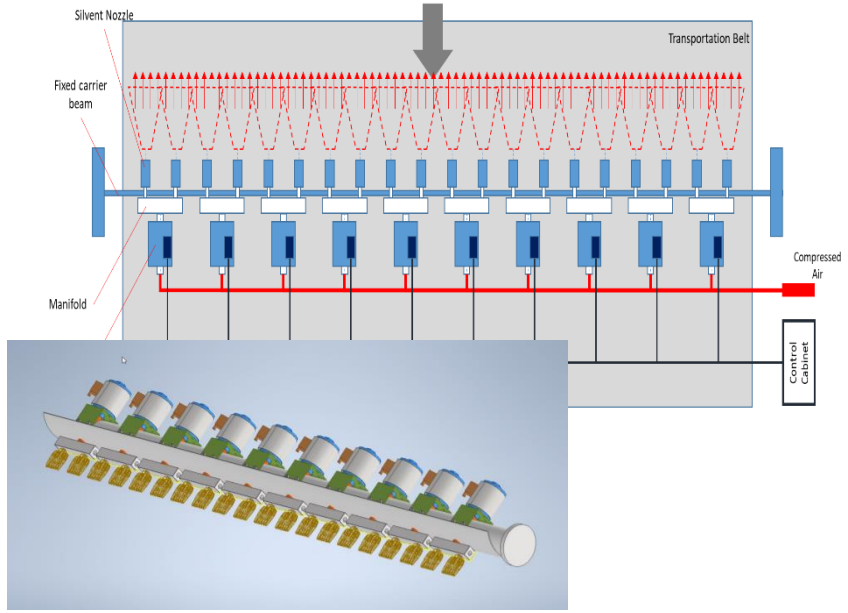
Customer:
- Subsidiary of an internationally operating beverage producer
- Reducing energy costs and increasing sustainability as a business objective

Application:
- Blowing off remaining adhesion from the surface after bottle cleaning
- Transport of the bottles without space between them
- Double-sided vertical blow-down
- Replacement of two open hoses as the original “system"

Optimization approach:
- Reduction of compressed air consumption by pulsed compressed air flow, defined frequency (min. 15 Hz.)
- Further reduction of consumption due to higher pulse effect of the pulsed air flow
- Branching of the compressed air jet on two flat nozzles

Improvements achieved:
- Reduced compressed air consumption from 130m^3/h to 32m^3/h
- Annual energy cost reduction of approx. EUR 4,000,- at EUR 0.02 per m^3 compressed air

Industry Example: Blowing off/drying of metal blocks during/after rolling process



Customer:
- Internationally leading manufacturer of rolled products made of non-ferrous metals
- High requirements regarding energy efficiency and process quality

Application:
- Phased manufacturing process requires cleaning and drying as an intermediate step
- Remaining chemicals reduce service life of cleaning baths used
- Current solution consists of a simple distribution pipe with screwed-in nozzles

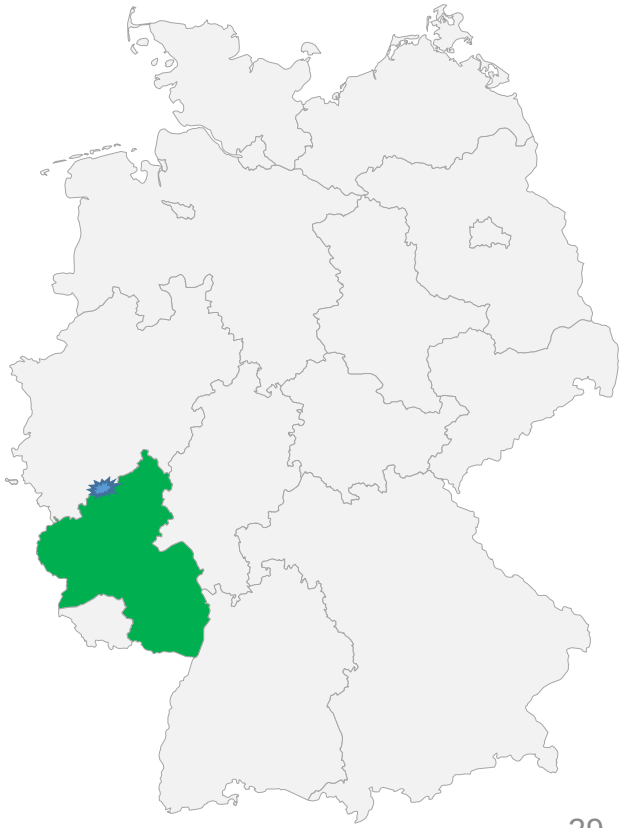
Optimization Approach:
- Use of 10 KTW AirFlowSaver as large “Air Knife”
- Reduction of compressed air consumption by pulsed compressed air flow (approx. 10 Hz., 30/70 open/closed)
- Reduction of system pressure from 6.2bar to 5bar
- Adaptation of beam width (40-160cm) and sensor-assisted stop in case of production interruption

Improvements Achieved:
- Reduced compressed air consumption from 800 m^3/h to 320 m^3/h
- Annual energy cost reduction of approx. EUR 29,000,- at EUR 0.015 per m^3 compressed air

About us:
KTW Technology GmbH is a team of experienced engineers and managers who have set themselves the goal of transferring outstanding innovations from aerospace technology to relevant industries. The standardized or customer-specific products address urgent challenges in customers' production systems and processes.

We are convinced that technological innovation is the key to an efficient and sustainable use of resources on our planet!

Visit our website at www.ktwsystems.de or see interesting videos about our technologies on our YouTube channel "KTW Technology GmbH“



Get in Touch:

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