



TECHNOLOGY & PRODUCTS



Providing Efficiency

At Clean Combustion we seek to improve environmental and corporate sustainability. Our products has proven improved energy extraction and reduced emissions in over a decade of global installations. A sustainable technology will do the same by using less, and outperform corporate and governmental policies.

Manageable technology which focuses on daily operations with easily accessible functions, self-cleaning design and highly reduced and simplified maintenance. Clean Combustion provides sustainable technology.



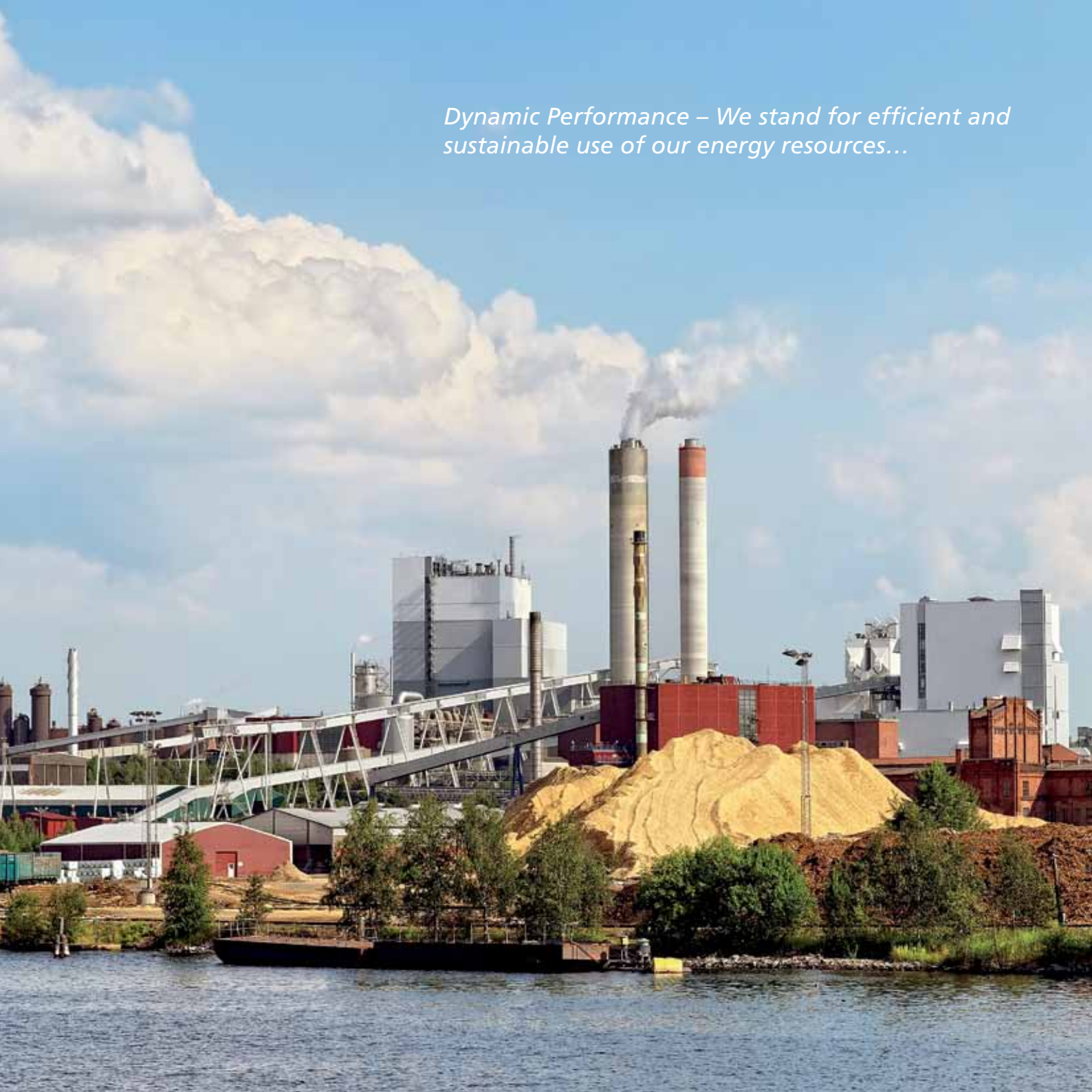
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For further information regarding our products and services, please contact a sales representative.

Visit www.cleancombustion.se/en/global-sales/elof-hansson-international.html, to find a representative in your area.

Dynamic Performance – We stand for efficient and sustainable use of our energy resources...



Dynamic and Designed Burners by Clean Combustion



Multi-fuel burner tip: Equipped with lances for liquid and slurry fuels in the center. Surrounding the center there are channels for gas, solid fuels, and air. It also houses the swirl turbulator.



Back of the burner: Connections for different types of fuel, air, and steam. Automatic controlled actuators, for adjustment of the dynamic areas inside burner.

Multi Fuel Burners, from 1-50MW

Clean Combustion design flexible and manageable technical solutions for both current and future energy infrastructures. Our burners provides improved energy extraction, resulting in lower emissions, better cost efficiency and higher up-time compared to previous generations. Clean Combustion's dynamic technology supports solid, slurry, fluid, and gas fuels, at single or multi-fuel operations within the same system. The combination of the vortex injectors, dynamic gas registers, and a flexible swirl turbulator gives the operator total control on the layout and position of the flame at different fuel flows and speeds. This helps to optimise the process and ensures a complete combustion of the fuel entering the zone, reducing fuel consumption and undesired exhausts particles. The manageable design is focused on daily operations and has easily accessible functions, self-cleaning, and highly reduced and simplified maintenance.

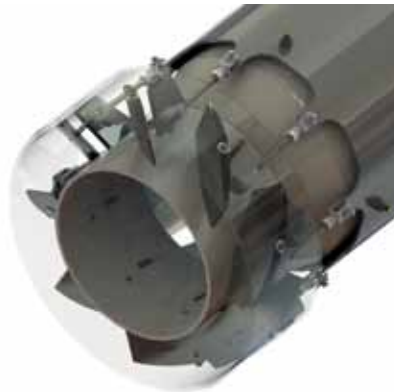
The back of the burner holds all the connections for fuels, air, atomisation media, and actuators. The actuators are controlling the dynamic features of the burner. The fuel lances supplies the fuel and atomisation media to the vortex injector, the injector mix the medias in-air towards the combustion zone. The gas is sent through the burner by a dynamic outlet channel towards the combustion zone. The adjustable area in the gas channel is automatically controlled by a optimal pressure of the gas entering the combustion zone. The burners can be equipped with several gas channels.

Air is supplied through the swirl turbulator and mixed together with the gas and the fuel before entering the combustion zone to ensure an optimised fuel/air ratio before combustion. This flexible Clean Combustion system provides high combustion rates even at fuel and fuel quality variations, allowing mixing of several fuels.

Open 0%



Open 50%



Open 100%



Swirl Turbulators

The swirl turbulator is used to steer and shape the flame in the combustion zone. Air is injected into the channel leading to the swirl turbulator, a speed controlled fan regulates the flow to keep a constant over-pressure. The swirl turbulator is adjustable, this gives control to rotation and stoichiometry of the air without losing pressure or speed. It enables an optimised combustion to a high variation of fuel flows. There is an additional channel outer the swirl turbulator functioning as a cooling channel to prevent the entire burner from over-heating.

Unique Vortex Injector Design

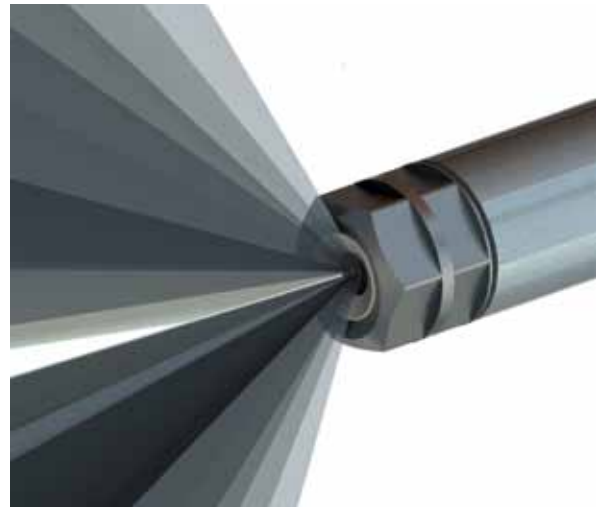
Liquid and slurry fuels entering the combustion chamber must be atomised to generate an efficient combustion. Clean Combustion uses a unique external mixing injector, replacing the function of the nozzle. Each burner can be equipped with several injectors to support different fuel types at the same time. The injector creates a vortex of the liquid/slurry fuel, it then applies the atomising media to create a conical shaped fuel mist directed into the combustion zone. The atomising media is either pressurised air or steam.

The injectors are designed according to flow rate and fuel characteristics. By later analysis of the combustion data, further improvements can be made through tuning the injector with interchangeable parts. The tuning controls the scattering angles and the rotation of the fuel mist, to ensure an efficient delivery to the combustion zone.



Main Advantages:

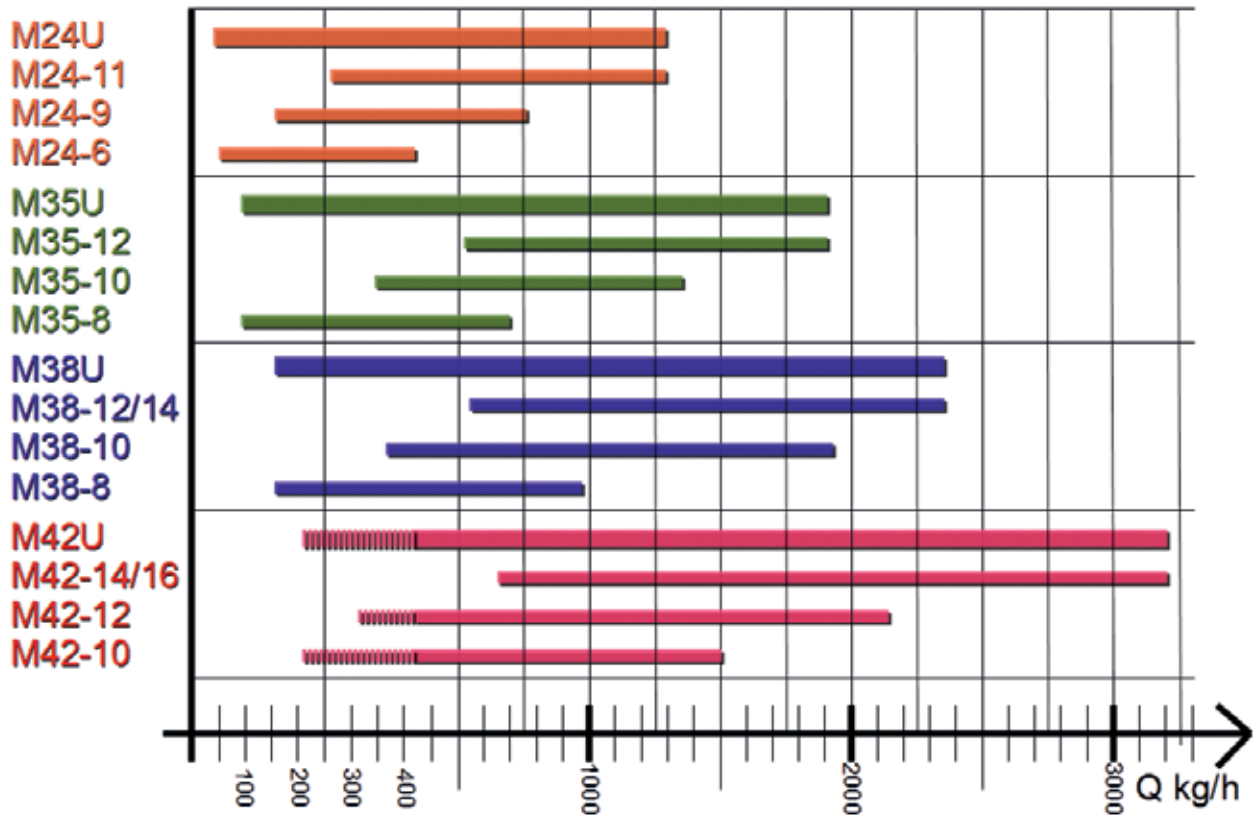
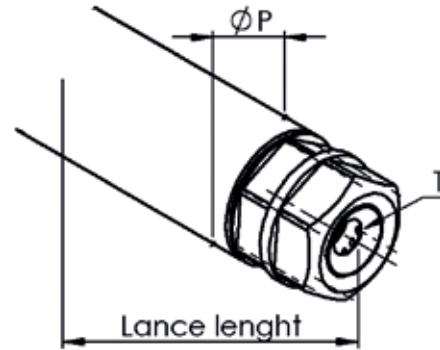
- Reduced fuel pressure
- Homogenous flame
- Reduced energy consumption
- Reduced emissions
- Increased uptime, 12-24 months
- Self cleaning design
- Control of viscosity by regulating fuel temperature
- Turn down ratio 1-6, 1-12



Fuel Lance

In the center of each burner there is room for up to 3 fuel lances. The lances are designed for liquid and slurry fuels.

The lance, its connections, and the vortex injector have different sizes depending on its designated fuel, its characteristics, and desired effects. Clean Combustions flexible design allows the fuel lance to be independently pulled out while another is in operation.



With different sizes of fuel lances and vortex injectors our products cover a wide range of effect output.

Automatic Gas Injectors

Clean Combustions automatic gas injectors are used in incinerators and gas burners, they can also be used as a mixer and gas control unit before a multi-fuel burner. The automatic gas injector facilitates alignment and operation of ejectors, which normally drive the combustion gases. The gas injectors constantly measure the gas pressure, when a desired pressure is reached the injector automatically opens its valves and allows the gas to flow through into the combustion zone. Independently of the gas flow, the valves can be controlled automatically or manually from the control room.

The gas injector is controlled either by using steam or water pressure, which also functions as an additional back-fire barrier in the gas outlet. During low or almost no gas flow the valves remain closed and prevents the occurrence of back-fire.



Gas burner



Kiln burner

Custom made Burners and Systems

For optimized combustion different fuels have different optimum speed entering the combustion zone, depending on desired effect a burner will deliver different amount of flow of that fuel. Clean Combustion have components designed for different effect of each possible fuel. By using several fuels running independently or combined together one can reach different registry and output effects. Startup can be done on low effect with one fuel, for more effect switch to next fuel, add more fuels and a mix of those to reach full effect. Clean Combustion builds custom made multi fuel burners and systems according to customers desires and needs by combining our components.

Fuel 1	X1	X2	X3				
Fuel 2		Y1	Y2	Y3			
Fuel 3				Z1	Z2	Z3	Z4
Fuel 4					Q1	Q2	
	Effect range for chosen fuel with CC std components						

Example: Chosen configuration x1, y2, z4, q1
 Min effect : x1
 Max effect with single fuel: z4
 Max effect: x1+y2+z4+q1
 Effect between min and max by mixing fuels

Examples of Fuels

Liquid

- Light oil
- Heavy oil
- Methanol
- Pitch oil
- Tall Beck oil

Solid

- Coal
- Biofuels

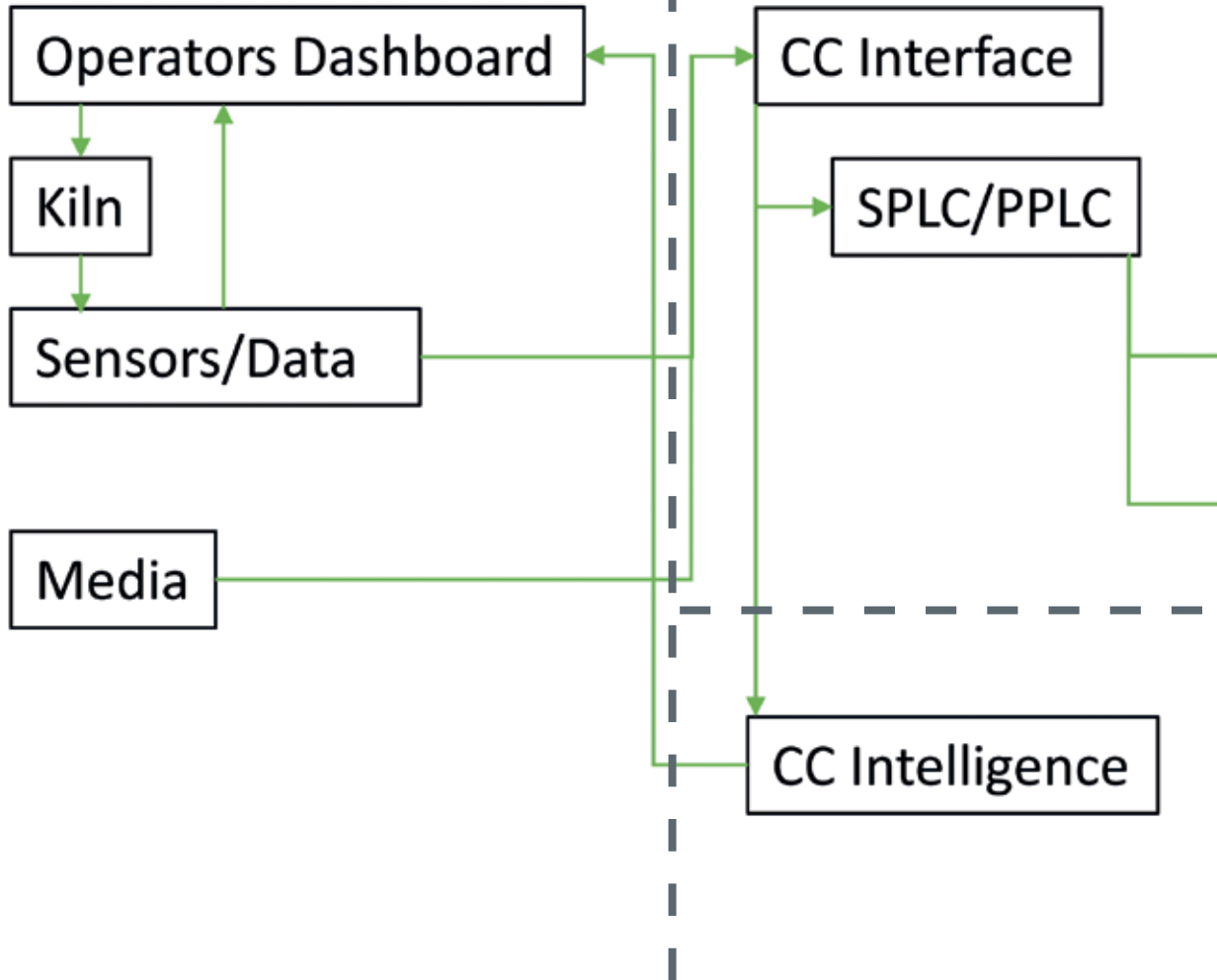
Gas

- Natural Gas
- Bio Gas
- NCG
- Stripper

Plants Systems

CC Control

Clean Combustions control system is the key system for analyze, control and optimizing of combustion data. The control system gives an efficient integration between plant system and Clean combustion burner products.



Systems



Automatic Control

Valve Train

CC Burner Hardware



Multifuel Burners

Autogas Burners



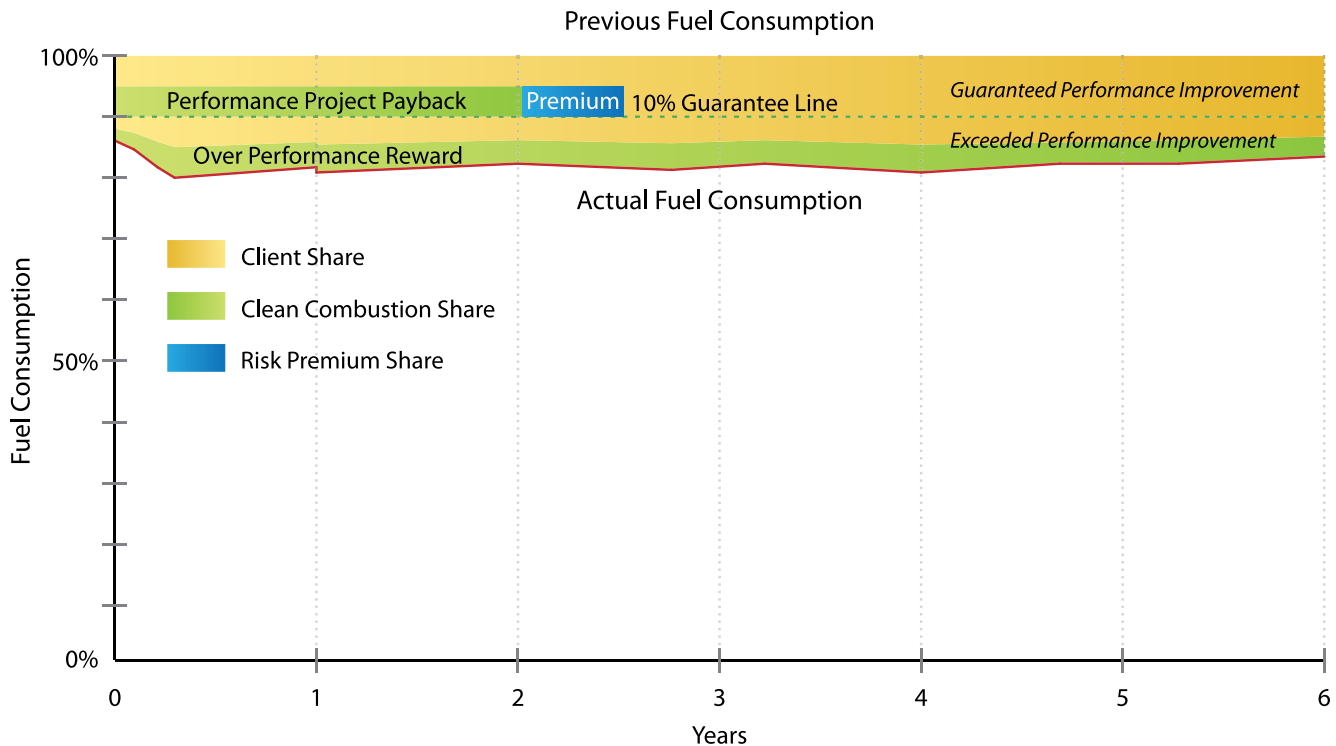
Dynamic Performance Projects

Clean Combustion now offers an overall commitment where we take responsibility of your combustion efficiency. We then guarantee a 10% fuel consumption saving. Dynamic performance projects contains three phases:

First a pre-phase project where we collect data from the current burner installation, then a second phase, containing installation and optimising of Clean Combustion products and equipment, finally a third phase of maintenance and continuous monitoring of combustion data.

The monitoring and combustion data connects our clients to our intelligence services. The Clean Combustion engineers can in real-time monitor operations and predict service needs, perform accurate remote distance diagnosis, and aid the client in finding the optimal operative setup according to their strategy, ensuring a maximised operative performance at low cost.

With this type of installation we can offer our equipment fully financed and insured with no initial cost for the customer, repayment is done through future savings. When the product is fully paid the guaranteed 10% fuel savings will be entirely to the customers benefit. The over performance saving, the actual saving minus the guaranteed 10%, will be shared between customer and Clean Combustion.



Our Roadmap

Vision	<i>Efficient and flexible combustion with manageable technology, that improves corporate and environmental sustainability</i>			
Innovation	<i>Designed for improved efficiency and flexibility</i>		<i>Designed to improve manageability and maintenance procedures</i>	
Technology	<i>Improved fuel atomisation</i>	<i>Dynamic fuel flows</i>	<i>Remote and precise control</i>	<i>Self cleaning and filter free</i>
Operation	<i>24 months uptime</i>	<i>Increased control range</i>	<i>Decreased fuel pressure</i>	<i>Multi-fuel combustion</i>
Efficiency	<i>Improved resource, capacity, and plant usage</i>			
Sustainability	<i>Efficient usage of energy and plant</i>	<i>Reduced environmental impact & emissions</i>		<i>Improved uptime and shortened maintenance</i>

Service and Maintenance

In our Maintenance & Stop Service Program we take responsibility for the combustion efficiency, our service organisation will assist with expert knowledge, service schedules and custom designed actions, to keep your plant optimally tuned to achieve optimal performance. Our products have long service intervals due to self-cleaning design, clean combustion, and low emissions. By monitoring combustion data from your site we can early see if efficiency is descending, and through our intelligence services, swiftly identify cause and advice on corrective actions.

Our way of working

- First, we introduce ourselves and listen to your needs.
- Inspection and overhaul of existing equipment and requests for improvements with the customer.
- Analysis, documentation and presentation of the inspection and technical proposals.
- Proposal for a package with fixed service costs and detailed technical material.
- New construction or upgrading alt. replacement of old or non-functioning equipment.
- Complete service and maintenance program for long-term performance and results.
- Training and information about applied technology.
- Start-up, optimizing and training of the operating organization.
- Timed monitoring and revision
- At last we listen if we performed as expected

Clean Combustion's Maintenance & Stop Service Program provides significant benefits for our customers:

- No capital investment in equipment and spare parts.
- Fixed charge.
- Preventive maintenance and tuning for optimal performance.
- Guaranteed Assistance.
- Improved energy use, lifecycle and overall economy.
- All necessary training of maintenance personnel and operators.
- Continuous inventory of spare parts and other components.
- Reports and follow-up service technicians from performed services and occurred disturbances.
- Web-based Management tool



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