

CleanSmoke



ENVIRONMENTALLY FRIENDLY SMOKING

Red Arrow Layman's Report 2015
ECO/11/304332 - CLEANSMOKE



Co-funded by the Eco-innovation
Initiative of the European Union

RED ARROW

CONTENTS

Introduction	3
Background	4
Objective	6
Anticipated results	10
Technical process	11
Environmental benefits	15
Profitability	23
Marketing and communication	26
About Red Arrow	27
Legal note	28

ENVIRONMENTALLY FRIENDLY SMOKING

The CleanSmoke smoking process from Red Arrow protects the environment and ensures safe food



Red Arrow, the market leader in smoking, smoke flavourings and their applied technologies, has developed a healthy and environmentally friendly smoking process with CleanSmoke. This technology was funded by the European Union within the framework of Eco-innovation, an initiative to launch innovative products with a positive environmental impact. Using regenerated smoke from smoke flavourings, CleanSmoke can replace

traditional smoking methods, which are primarily used for cold smoking foods. The new CleanSmoke smoking process allows food manufacturers to protect the environment, increase food safety and improve working conditions. This report summarises the most important findings of a three-year study conducted in two European test markets, where CleanSmoke was analysed compared to two traditional smoking methods.

BACKGROUND

Traditional smoking is risky

Smoking is indeed one of the oldest methods for preserving food, however it is not quite the healthiest or the most beneficial to the environment. Despite all that tradition, a number of pollutants, primarily ash, tar and polycyclic aromatic hydrocarbons (PAHs), which are produced from smouldering wood, penetrate the food along with the smoke and are subsequently consumed. Traditional smoked foodstuffs therefore generally give rise to health concerns.

Due to the system technology, the fire used in traditional smoking poses an increased risk of fire and

explosion in the smoke departments and employees may be directly exposed to the smoke at the workplace. In addition, there is also a high environmental impact: In particular, the CO₂ emissions and water consumption are higher and the waste water accumulated when cleaning the smoking plant is contaminated with significantly higher levels of chemicals and other pollutants than when smoking using regenerated smoke from liquid smoke. In this process developed by Red Arrow, no pollutants can enter the smoked food along with the smoke, because they are filtered during the production of the liquid smoke.

WHAT IS LIQUID SMOKE?

Liquid smoke is a pre-purified primary smoke product; in other words, the purified, watery part of the smoke passes through water for cleaning, where it is condensed. It is one of the primary products, which is processed further to create smoke flavourings in solid or fluid form. A stable and dry smoke can be produced from the pre-purified primary smoke products through atomising. This smoke lends smoked food its typical characteristics, such as taste, appearance and shelf life. Smoke flavourings are used throughout the food and pet food industry, for example, to provide meat, fish, cheese or sauces with a smoky taste. They are either used for processing the surface of the product or adding directly to it during the production process.

WHAT ARE POLYCYCLIC AROMATIC HYDROCARBONS (PAH)?

PAH is a generic term for a chemical substance group of organic, aromatic compounds, which can cause cancer. They are solid, generally colourless, chemically stable, however, light-sensitive compounds, which dissolve well in grease, but are hardly soluble in water. Polycyclic aromatic hydrocarbons are produced through the incomplete combustion (pyrolysis) of organic materials (wood, charcoal, benzene, oil, tobacco, waste) as well as during grilling, roasting or smoking. They always occur as a mixture and spread with smoke, flying dust and soot particles.

OBJECTIVE

Promoting environment friendly technologies

Due to various negative impacts on health and the environment, traditional smoking does not comply with the European Union (EU) guidelines. The EU is striving to make food safer so that it does not pose any risk to the health of consumers. Guidelines also call for better protection of the environment, etc. Discussions concerning new environmental assessments of products, also in the food sector, such as the CO₂ emissions per kilogram of meat, make it perfectly clear that taking environmental protection into consideration in meat

production is becoming increasingly important, and is also a sign of quality. Eco-innovations, for example, can help achieve these objectives.

The Eco-innovation Action Plan (EcoAP) was therefore launched in 2011. This plan is based on the European Action Plan for Environmental Technologies (ETAP) from 2004, which taps into the potential of environmental technologies to make an important contribution to increased competitiveness and sustainable growth.



EcoAP expanded its focus on all aspects of Eco-innovations. It therefore supports innovative products, services and technologies. They can be used to reduce Europe's environmental footprint as well as to enable resources to be used more efficiently. In addition, they aim to promote growth and create jobs. The concept for cold-smoking processes developed by CleanSmoke was therefore promoted in line with EcoAP due to the advantages it offers over conventional smoking methods.

CleanSmoke has already been successfully established in Germany. Plans are now in place to launch it in the two Eco-innovation test coun-

tries Denmark and the Netherlands first, with a production volume totalling 3,600 metric tons of cold-smoked products. Afterwards, the innovative smoking technology is set to be established in seven other EU countries, thus providing European food producers with access to this innovative technology.

The new CleanSmoke smoking process, which uses smoke regenerated from primary smoke products, allows food manufacturers to protect the environment, increase food safety and improve the working conditions of their employees. The smoking process takes place in a closed circuit, thus allowing up to 80% of CO₂



emissions to be reduced compared to traditional smoking. The use of environmentally harmful cleaning agents and water is reduced by up to 70%, as the regenerated smoke does not contain tar or ash.



This innovative process offers nothing but advantages to consumers. Now more than ever, customers are focussed on the quality of foodstuffs. Of course, one part of this is ensuring that the product does not pose any health risks. A huge advantage for CleanSmoke is that the smoke is absolutely free of harmful substances. In contrast to the traditional smoke, it does not contain any tar, ash or polycyclic aromatic hydrocarbons (PAHs), such as carcinogenic benzopyrene, which can be deposited on the foodstuff in conventional smoking processes. Such high-quality products, such as salami, in particular, should not contain any harmful substances. They considerably reduce the quality.

The CleanSmoke smoking process is also an attractive option for organic food, which is becoming increasingly popular. After all, most products are only considered "organic" if they fall below limit values for pollutants and do not contain any preservatives. For example, cold smoking raw fermented sausage and hams with CleanSmoke eliminates the need for chemical preservatives, such as potassium sorbate.

The composition of the regenerated smoke plays a huge role in producing the traditional smoky flavour and preserving effect in conventional smoking processes, for example. Various studies have confirmed that real smoke is created from purified primary smoke products. With the composition of the gas phase and particle sizes, this regenerated smoke equates to combustion smoke in terms of its composition, for example.

CONVENTIONAL SMOKING PROCESSES

Combustion smoke is most commonly used in conventional smoking. Sawdust is fed continuously or at intervals into the glow zone, which is ignited using heating wire and placed under an air stream for carbonising. The temperature here ranges between 500 and 800 °C. An air purification system is used to reduce the pollutants of exhaust air.

In contrast to combustion smoke generation, friction smoke is generated by pressing squared timber against a rotating friction wheel. To develop smoke, the temperature on the friction area is increased up to 400 °C. In order to prevent the friction wood from igniting, the smoke generator operates for 20 seconds in two-minute intervals. Friction smoke is characterised by a low tar content and only a few polycyclic aromatic hydrocarbons (PAH). An air purification system is only rarely required.

ANTICIPATED RESULTS

These advantages can be expected

CLEANSMOKE INDICATORS AT THE END OF THE PROJECT

Objective	Indicators	Relative impact	
Improved environmental performance	Greenhouse gas emissions	CO ₂	-79%
	Air quality	Particulate matters	-87%
		Volatile organic compounds (VOC)	-64%
	Reduction/substitution of dangerous substances	Mutagenic/carcinogenic	-71%
		Toxic	-100%
Persistent/bioaccumulative		-69%	
Better use of natural resources	Reduced resource consumption (excluding energy)	Sawdust from hardwood	-33%
	Water	Waste water	-71%
	Energy	Reduced energy consumption	-25%
Economic performance	Reduction of cost per unit or process		-48%*

* Incl. emission measurement and waste disposal (combustion smoke)



TECHNICAL PROCESS

How cold smoking with CleanSmoke works

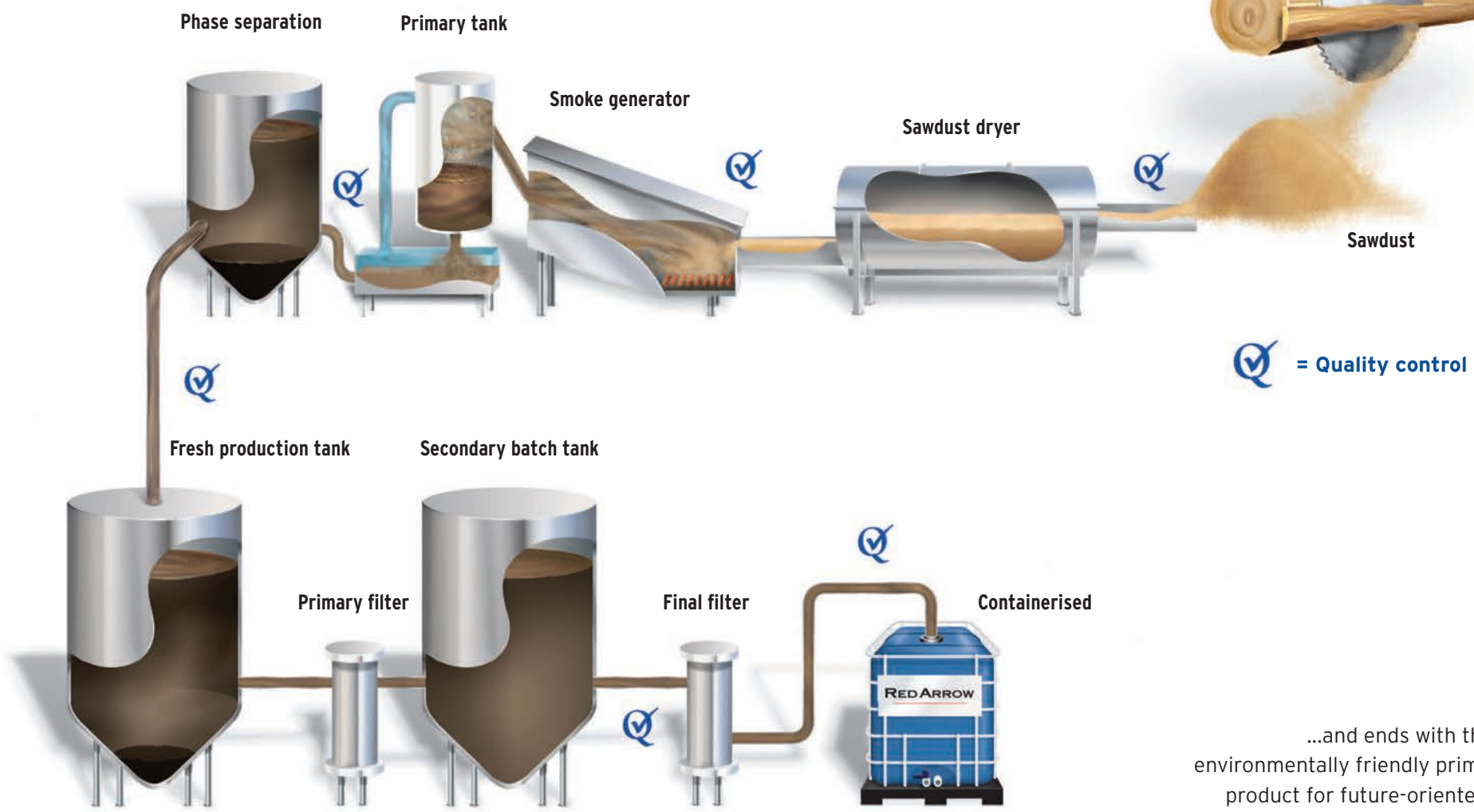
Compared with traditional smoking methods, smoking raw fermented sausages, ham and other typical cold-smoked products with CleanSmoke is clean, safe and environmentally friendly. This is because with this process, the smoke is not generated from smouldering wood, but in the SmartSmoke smoke generator from a primary smoke product. At first, this may sound very technical and perhaps a little unbelievable. There is no magic formula for this, however. In fact, it is relatively simple. A primary smoke product is nothing but smoke absorbed in water, which was created by smoul-

dering sawdust and then filtering it over several stages.

Red Arrow manufacturers primary products at two manufacturing facilities in the United States. The smoke is produced under controlled conditions from untreated sawdust from various hardwoods, such as hickory, maple or oak, which are obtained as a waste product in the timber and furniture industry. This smoke is condensed out with drinking water and then cleaned in a multi-stage filtration process to remove undesired substances, such as ash, tar and polycyclic aromatic hydrocarbons (see figure p. 12/13).

Red Arrow production process

The process starts in the forest/woods in which the natural hardwoods for the construction industry are chopped down...



...and ends with the purified, environmentally friendly primary smoke product for future-oriented smoking.

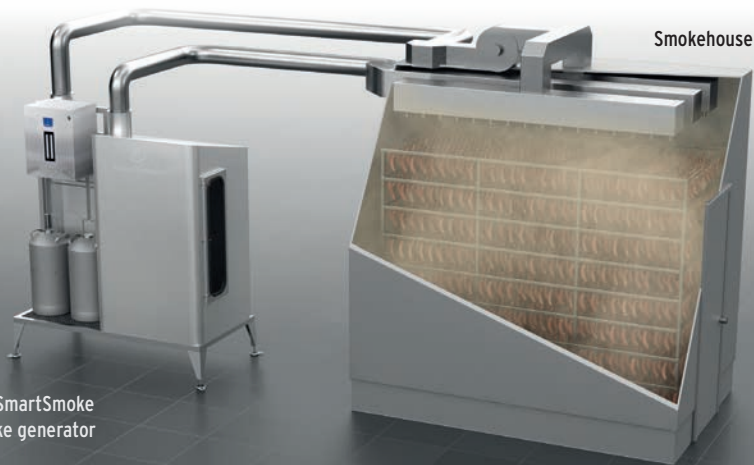
The smoke is then regenerated from the pre-purified primary smoke product using compressed air in the SmartSmoke smoke generator in a closed circuit, which is used in modern smoking processes, such as CleanSmoke, for smoking food. Thanks to the special primary smoke products tailored to this process, the results of the smoking are particularly constant and can be individually defined in terms of the smoke colour and the intensity of the flavour (see figure).

A whole range of factors must be considered for the product quality of salami or hams: For example, the complete smoking process, from drying and pre-curing through to the actual smoking and the post-curing, is just as important as the product's ingredients. With the CleanSmoke smoking process, the smoke

is generated outside the smokehouse and fed into it through smoke pipes and injection ducts. The injection ducts ensure the uniform distribution of the smoke. The exhaust air from the smokehouse is returned to the smoke generator and thus remains environmentally friendly in a closed circuit.

Depending on the foodstuffs to be smoked, the cold smoking is generally carried out at a temperature between 15 and 25 °C. The temperature, which can vary during the smoking process, is critical in cold smoking, as it has an enormous influence on the so-called starter cultures, which are responsible for the desired pH value in salami, for example. And the dehydration before the smoking is critical for the flavour, texture and stability of a salami, for example. The complete smoking process can last from a few hours to several weeks.

The smoke is generated fresh and fed into the smokehouse through smoke pipes



The SmartSmoke smoke generator



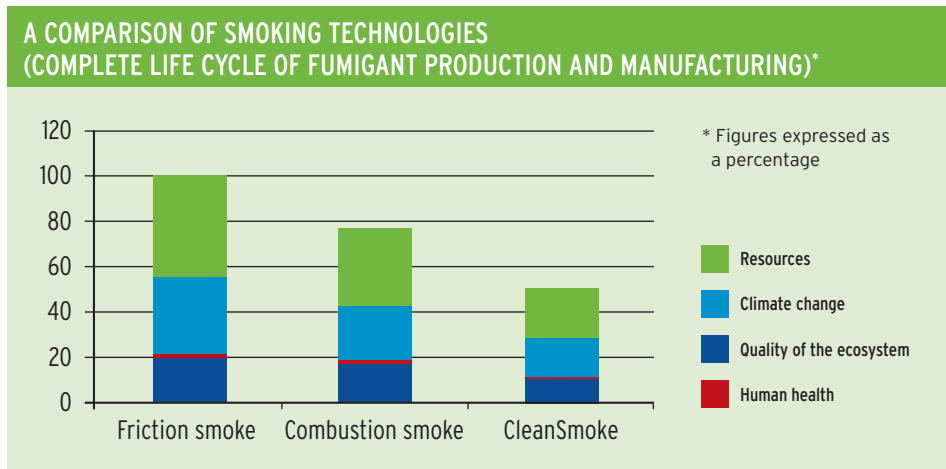
ENVIRONMENTAL BENEFITS

The environmental balance clearly speaks in favour of CleanSmoke

Burning or smouldering wood produces a number of substances, some of which have temporary or permanent negative impacts on the environment. Combustion smoke consists of approximately 25% gas, roughly 27% water vapour, 32% charcoal (ash) and 16% tar. In chemical terms, the smoke is a mixture of numerous compounds, of which around 800 have been identified so far. The quantity of the added atmospheric oxygen, the moisture content of the wood and the smoke temperature are critical for the proportion of desired and undesired compounds in the smoke.

According to EU directive 96/91/EC (Integrated Pollution Prevention and Control), manufacturing plants must employ processing technologies that offer the best possible protection for the environment (air, water and soil).

The smoking process using pre-purified primary smoke products definitely meets these requirements. After all, the manufacturing process itself, where freshly developed wood smoke is processed into primary smoke products and smoke flavourings, as well as their use in the production of foodstuffs, is implemented with the goal



Source: Final report on life cycle assessment of meat products smoked by the use of purified primary smoke products in comparison to conventional smoking for RED ARROW HANDELS-GMBH, Bremen; Deutsches Institut für Lebensmitteltechnik e.V., March 2015

of minimising environmental impacts. This can be demonstrated by an environmental balance.

Life cycle assessment of three smoking processes

To do this, Red Arrow conducted a life cycle assessment (LCA) on the CleanSmoke process within the scope of the Eco-innovation project in cooperation with the German Institute of Food Technology (DIL) to prove the environmental benefits of the technology compared to the two traditional smoking processes using combustion smoke and friction smoke. Some of the findings are downright surprising and were perhaps not necessarily expected with such clarity.

For example, with a sum of only 0.9 to 7%, manufacturing fumigants does not have the greatest environmental impact. In fact, it is attributed to the total energy consumption required for generating the smoke. In combustion smoke technology, however, wood growth is the individual aspect with the greatest impact, since heavier, slower-growing trees (beech) are generally needed for smoking compared to the other two technologies - followed by CleanSmoke and friction smoke. Other wood types would indeed yield better results, however, the advantage in the overall balance would amount to no more than 5%. On the other hand, the combustion smoke technology displayed the best performance in producing ready-made fumigants.

CleanSmoke offers climate control benefits

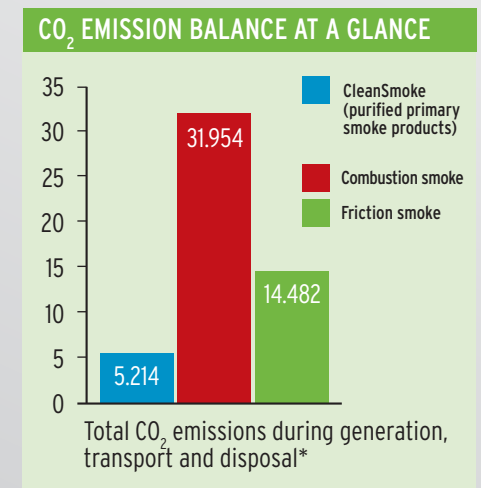
While the wood for conventional smoking only frequently offers shorter transport distances to the smoking facilities, Red Arrow's primary smoke products are manufactured in the USA. The transport to the end consumer in Europe (in this case Germany) accounts for a CO₂ balance of 0.55 kg per metric ton of foodstuffs, which represents 11.5% of the environmental impact. This could be improved through local production. With an average distance of 300 km, only approximately 0.2 kg of CO₂ is attributed to the transport of timber for conventional smoking.

While conventional smoking (friction smoke or combustion smoke) requires approximately 3.75 kg of wood chips per metric ton of smoked foodstuffs (salami, for example), pre-purified primary smoke products only require 600 grams. This can be manufactured in an industrial process from 1.9 kg of sawdust, a resource-saving waste product from the furniture and construction industries. Here is an environmental benefit: Half the smoking material thus also means half the CO₂ emissions - instead of a good 6 kg with traditional smoking, only a little over 3 kg is required for primary smoke product.

For the ignition process and smoke circulation in generating combustion smoke, 0.37 kg of CO₂ is emitted per metric ton of smoked food; friction smoke generation, on the other hand, consumes 12 kWh of electricity emitting 7.44 kg of CO₂. The smoke generation, condensation and cleaning required in primary smoke production results in emissions totalling 1.7 kg of CO₂ per metric ton of smoked foodstuffs. In addition, 0.5 of kWh of electricity is consumed by the smokehouse producing an additional 0.31 kg of CO₂.

Purified smoke produces less waste

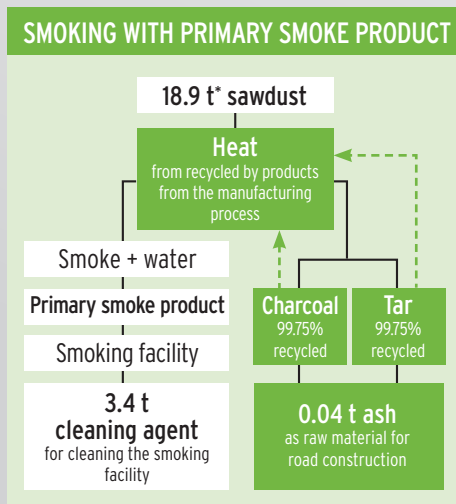
A good half of the materials used in generating conventional smoke end up as waste for disposal. Approximately 0.5 kg of CO₂ is produced per metric



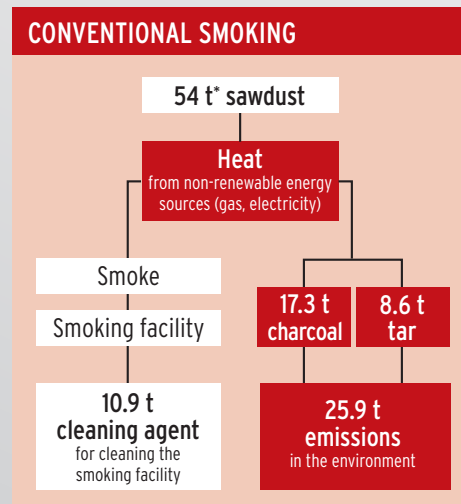
* Information in kg of CO₂ emissions per metric ton of smoked foodstuffs (example of smoking ham)

ton of smoked foodstuffs, which is attributed to cleaning, waste disposal and transport. When manufacturing primary smoke product, on the other hand, less than 1% of the materials used ends up as waste. Tar and charcoal, which are filtered out of primary smoke product, are used for energy generation or in road construction and improve the CO₂ balance by around 0.3 kg of CO₂. Overall, the CleanSmoke process only produces 0.1 kg of CO₂ per metric ton of smoked foodstuffs for cleaning, disposal and transportation. In contrast to generating friction smoke and primary smoke product, smoke gases must be re-burned when using combustion smoke. To do so, around 10 m³ of natural gas is consumed for each metric ton of smoked foodstuffs, which equates to just under 25 kg of CO₂ emissions.

A total of 5.2 kg of CO₂ per metric ton of smoked foodstuffs is produced during the creation, transportation and disposal of purified primary smoke products. In contrast, friction smoke generation already produces over 14 kg of CO₂ and combustion smoke generation creates almost 32 kg of CO₂. In summary, using pre-purified primary smoke products reduces CO₂ emissions by over 83% compared to combustion smoke generation and which still eclipses the 60% of CO₂ emissions savings compared to friction smoke generation. This is attributed to reduced wood use and energy consumption thanks to smoke generation on an industrial scale coupled with the fact that there is no need to re-burn smoke gases.



* To produce 3,600 metric tons of smoked meat products



* To produce 3,600 metric tons of smoked meat products

OVERVIEW OF CO₂ EMISSIONS BALANCE

Source	CleanSmoke	Combustion smoking	Friction smoking
Raw smoking material (wood, wood chips)	3.043	6.038	6.038
CO ₂ emissions from smoking, smoke flavouring (filtering in water)	1.705	*	*
CO ₂ emissions through energy required for friction: example 12 kWh 1 t smoked ham	*	*	7.44
Energy from waste accumulating (negative)	-0.342	0	0
Post-process gas burning at combustion: example 10 m ³ natural gas for 1 t smoked ham	*	24.85	*
Smoking/smoke flavour distribution (duration 1 hour at 0.5 kW power + ignition in combustion)	0.155	0.372	0.31
Transport (wood and smoking material/ primary smoke product)	0.553	0.194	0.194
CO ₂ emissions by internal transport/ cleaning/waste, estimated value	0.1	0.5	0.5
Total	5.214	31.954	14.482
Emission reduction by use of primary smoke product	-	83.68%	60.62%

Values in kg CO₂ emissions per metric ton of smoked foodstuffs (example of smoking ham).
 * Not necessary for this procedure

Source: Final report on life cycle assessment of meat products smoked by the use of purified primary smoke products in comparison to conventional smoking for RED ARROW HANDELS-GMBH, Bremen, Deutsches Institut für Lebensmitteltechnik e.V., March, 2015

Reducing water consumption and pollutants thanks to CleanSmoke

Water consumption is greater in traditional smoking and the waste water accumulated during with the required smoke gas cleansing is significantly

more heavily polluted with hazardous substances. The use of conventional smoke requires that the smoke system be cleaned with smoke resin removal agents. In addition to the resins, tar and ash must also be washed out of

the smokehouse. Altogether this generates high pollutant and contaminant levels for the cleaning water, which, in turn, must thus be disposed of separately.

Furthermore, smoking using CleanSmoke completely eliminates the problem of exhaust air contaminated with pollutants. It is practically impossible to smoke foodstuffs using smoke freshly generated from wood in a closed system, since the tar and ash produce an explosive mixture. These substances are not found in primary smoke products, since the tar and ash are already removed from this manufacturing process. In addition, no open fire or embers are present when using pre-purified primary smoke products. Since there is no combustion, no nitrogen oxides (NOx) or carbon monoxide (CO) are created. Measurements have also demonstrated that the NOx limit values for thermal and catalytic re-burning plants could not be met by any of the afterburners tested.

Conclusion

As mandated by EU law, environmental protection is paramount in the process for manufacturing pre-purified primary smoke product and its

80%

Around 80% of CO₂ emissions can be reduced by using CleanSmoke, compared to traditional smoke processes.

application, which, in turn, yields a positive overall environmental balance. In a nutshell, when you take all the processes steps into consideration, you can say that the smoking process using primary smoke products has the least environmental impact compared to combustion and friction smoking processes. The benefits can be seen above all in smoking plants: Here, CO₂ emissions can be slashed by up to 80% and energy, water and cleaning detergent consumption by up to 70%. The harmful polycyclic aromatic hydrocarbons (PAH) can also be reduced by up to 70% in smoked foods. The PAH value cannot be completely eliminated, since the remaining 30% is attributed to other sources, such as spices or natural occurrence.

Measured results of environmental influences

THE MOST IMPORTANT ENVIRONMENTAL BENEFITS FROM PRE-PURIFIED PRIMARY SMOKE PRODUCTS AT A GLANCE

Indicators	Relative change*
CO ₂	- 83%
Exhaust emissions	- 100%
Waste volume	- 100%
Process water	- 100%
Cleaning water	- 88%
Cleaning detergent	- 68%

* Compared to combustion smoke

There is no fire or explosion hazard with CleanSmoke

Some of the environmental impacts of the traditional smoking process described above not only have an indirect impact but also have a direct impact on people. Smoke gases, produced when smouldering sawdust,

for example, can have a toxic and/or carcinogenic effect on people. In addition, conventional smoking plants are risky workplaces, as smoke gases can cause fires and explosions. Reducing the risk of such accidents requires an enormous amount of work coupled with large investments. The



formation of explosive mixtures can only be prevented through design or control engineering measures. As a result, smoking-plant manufacturers must provide documentation verifying that the plant was properly designed. Furthermore, the system operator must work with specialists to identify the hazards presented by system operation and determine protective measures as well as verify the results and measures in an explosion protection document.

In contrast, working with systems using regenerated smoke from pre-purified primary smoke products is a great deal safer and eliminates health risks altogether. Here, the smoke is generated in a closed system. This, in turn, eliminates a major fire risk in the smoking compartment. In addition, there are no harmful substances, such as CO and PAHs, which employees may come into contact with in conventional smoking compartments. The risk of cancer-causing wood dust is ruled out, as no wood shavings are used.

A further advantage of generating smoke from primary smoke products is that the smoke does not contain any explosive components, such as tar or ash, since they are removed

from the smoke when manufacturing the primary smoke product. The preventative checks on the smoking system mandated by the explosion protection ordinance are thus no longer applicable and smoking through the night is also possible without supervision. This relieves personnel from the night shifts.

Easy-to-handle pre-purified smoke products

Primary smoke products are very easy to store, since they are not flammable. As a result, fire protection regulations do not apply, so fire protection doors and sprinkler systems are not required for the storage room. The easier handling of the smoking material also contributes to healthier working conditions. The primary smoke product is fed through pipework into the corresponding storage tanks on the smoke generator via a central filling system. This improves the hygiene in the smoking compartment and also reduces the physical work for loading the smoke generator. The space requirements for the storing the smoking material are minimal. A container (1,150 kg) holding condensed pre-purified smoke product replaces approximately 20 pallets (4,000 kg) of sawdust. This provides additional advantages in transportation and also saves costs.



PROFITABILITY

New markets for a profitable technology

A study backed by the European Union within the scope of the Eco-innovation project is aiming to introduce CleanSmoke into the European market and make the technology available throughout Europe. The market launch was prepared at the European level during the three-year project period from 2012 to 2015. The European Union shouldered half of the project costs for this totalling just over 700,000 euros.

The necessary investments for a smoking plant are quite substantial.

It is therefore important for food producers to know whether the costs for investing in a new technology, such as CleanSmoke, are worthwhile. Red Arrow has therefore studied the feasibility and the opportunities for a successful market launch. To this end, various target markets as well as their individual special features and challenges were identified.

The meat industry must navigate a wide range of challenges. Manufacturers are facing increasingly strict guidelines regarding food safety,



environmental protection, employee safety and hygiene in food processing. What's more, the regulations apply both at the national and the EU levels. In addition, the demand from retailers and consumers for safe and sustainable food is on the rise.

CleanSmoke is also suitable for organic food

Red Arrow has met this demand with CleanSmoke technology. For example, the SmartSmoke smoke generation system, which is used in the CleanSmoke process, complies with

all EU standards and allows meat producers to produce safe products. The EU has also determined that the smoking process that uses regenerated smoke is safe and thus confirms the claim of this technology. In addition, the confirmation represents the first step necessary for approving the CleanSmoke smoking process for the production of increasingly popular organic food according to the applicable EU regulation.

The main target group for the CleanSmoke technology includes

large-scale and medium-sized meat-processing companies, which produce cold-smoked food. In economic terms, the study achieved very

good results in the two pilot plants in Denmark and the Netherlands, with a production volume totalling 3,600 metric tons of cold-smoked products.

THE MOST IMPORTANT COST SAVINGS OF SMOKE FROM PRIMARY SMOKE PRODUCTS AT A GLANCE

Indicators	Relative change*
Cleaning including cleaning agents and disposal	-87%
Energy for smoke generation and exhaust gas cleaning	-90%
Overall production per unit or process	-28%**

* Compared to combustion smoke
 ** Without emission measurement and waste disposal



The next step now focuses on launching CleanSmoke in the seven European countries Belgium, Finland, Austria, Poland, Sweden, the Czech Republic and Hungary.

This is all part of Red Arrow's three-year plan: Following the successful pilot phase in Denmark and the Netherlands, the objective for 2015 is to install at least one CleanSmoke facility in each of the seven EU countries mentioned. Two additional facilities are to follow in each target market in 2016. Plans call for defining and conquering new EU markets in 2017.

MARKETING AND COMMUNICATION

Transferring knowledge, earning trust

The results of the three-year study demonstrate that there are considerable information and knowledge gaps concerning smoking in the planned European target markets, both on the side of the consumer as well as the meat processing industry. In the interest of establishing informational and transparent communication regarding the benefits of the CleanSmoke smoking process, plans have been set in motion to implement the marketing and communication activities presented in the graphic below in the test markets of the Netherlands and Denmark for the time being.

MARKETING AND COMMUNICATIONS EFFORTS AT A GLANCE

Customer references	Market potential - Netherlands - Denmark	Contracting - Distributor - Customer	Travel/transport - Hotel - Equipment - Sample	Presentation - Technology - Process flow - Trade samples
Trade fair	Netherlands - Utrecht Denmark - Herning	Fair ground - Offers - Booking	Booth constructor - Tender offer - Booking - Construction - Transport equipment	Fair participation - Invitation - Hotel - Catering/ hostesses
Distributor workshop	Organisation - City, hotel, conference room - Evening programme - Transport equipment	Preparation - Invitation - Presentation - Video/image material - Giveaways	Technical seminars - Presentation - Communication - Seminar folders (workflows)	Presentation - Technology - Products - Process flow - Tasting
Media work	Professional articles - Translation - Image material	Placing advertisements - (Trade) magazines - Ad rate - Booking	Distributor brochures - Translation - Transport - Distribution	Sales mailing - Translation - Transport - Distribution

THIS IS RED ARROW

The no. 1 in the market of smoke flavourings

Red Arrow is the market leader for smoking, smoke products and smoking technologies. Red Arrow Handels-GmbH in Bremen, Germany is a subsidiary of the U.S. Red Arrow Group and supplies food manufacturers in Germany, Austria and Switzerland. Since cold smoking in these countries plays an important role, Red Arrow has developed a smoke generation system based on technology with freshly generated smoke from pre-purified primary smoke products, which meets the special requirements for cold-smoked products (e.g. salami, raw ham, fish and cheese). The CleanSmoke project was started after successfully developing a suitable smoke-generating component for use in cold-smoking facilities. With the special SmartSmoke smoke generator as the central unit, the CleanSmoke concept is the next generation of smoking technology for cold-smoked products. This was made possible, above all, due to the significant reduction of emissions and energy consumption.

The food chemist Dr Clifford Hollenbeck already developed a patented process for producing pre-purified primary smoke products back in 1956.

These products are aromatic components of smoke produced during the smouldering of sawdust from natural hardwood, which are absorbed in water. Shortly thereafter, there was a high demand for these flavours. Red Arrow was founded for the manufacturing and marketing. Over the years, Red Arrow continuously developed and improved these pre-purified primary smoke products to provide the entire food industry with access to these innovative products. A great deal of energy has been, and continues to be, poured into the research and development of this. Red Arrow took root as the inventor and over time established itself as today's market leader in pre-purified primary smoke products and their application for smoking using regenerated smoke.

Legal note

Publisher

Red Arrow Handels-GmbH
Hanna-Kunath-Straße 25
28199 Bremen, Germany
Tel.: +49 421 59657-0
Fax: +49 421 59657-10
Email: info@red-arrow-deutschland.de
Internet: www.red-arrow-deutschland.de
www.cleansmoke.info

CleanSmoke Project Coordinator

Karl Bärwinkel
Red Arrow Handels-GmbH
Tel.: +49 421 59657-24
Email: k.baerwinkel@red-arrow-deutschland.de

Concept & editing

Karl Bärwinkel
Red Arrow Handels-GmbH (responsible)
Tel.: +49 421 59657-24
Email: k.baerwinkel@red-arrow-deutschland.de

crossrelations brandworks GmbH (GPRA)

Tel.: +49 211 882736-10

Fax: +49 211 882736-11

www.crossrelations.de

Artwork & composition

M! Designbüro

www.mathias-hoffmann.com

Print

public emotions

Marketing- und Medienagentur GmbH

www.public-emotions.de

Photo credits

Red Arrow Handels-GmbH, Fotolia.com (© juniart,
© Denys Rudyi, © JWS, © VOLODYMYR BURDYAK,
© Barbara Dudzińska, © Igor Link), istockphoto.com
(© Alberto Simonetti, © Mike Pellinni, © -M-I-S-H-A-)

Co-funded by the Eco-innovation Initiative of
the European Union (with EU log and number:
ECO/11/304332-CLEANSMOKE)

© 2015

All rights reserved.



Co-funded by the Eco-innovation
Initiative of the European Union

RED ARROW