Rapid Start High output, Clayton Steam Generators supply auxiliary steam for France’s largest combined cycle power.

Each of the two Clayton Steam Generators at the Endesa, Emile Huchet Power Plant have a maximum net steam production rate of 13,400 kg/h (10MW) and are available as-and-when required to provide gland sealing for the giant steam turbines. The Clayton Steam Generator is of a unique design that gives maximum operational flexibility and can start-up from cold to full output in 10 to 20 minutes in this large size range.

The gas fired, Emile Huchet Power Plant was built by Siemens Power Generation at the existing power station site in Saint Avold, Lorraine which is 20 kilometers from the French-German border.

The high-efficiency plant is designed for cost-efficiency, flexibility, and environmental compatibility and consists of two units, each having a capacity of 430 megawatts (MW). The output is equivalent to the electricity consumption of one million households.

Two Clayton Steam Systems have been installed at the site. The Clayton Steam Generators are located outside in the process area and each system was supplied as a modularised concept to reduced installation time on site and to ensure the high quality that comes from specialist factory manufacture and quality control.

A separate weather-proof enclosure houses the ancillary equipment that is necessary for a complete operational boiler system. This includes the main feedwater supply pumps, thermal deaerator and control system. In this case the thermal deaerator is mounted on the roof of the enclosure.

The equipment was pre-wired, piped and insulated in the factory and includes all safety devices, platforms, handrailing, etc.

The model SEG1004 is fitted with a Clayton Economiser which further improves the already high efficiency of the Clayton Steam Generator.

Because of the quick start up capability of the Clayton Steam Generator it does not have to be kept warm when steam is not required but is available at a moments notice by the flick of a switch when it rapidly achieves full output.

The module concept has been constantly developed by Clayton Steam Systems and large output units are available as trailer mounted boiler houses, special containerised systems for offshore oil platforms, site-assembled sectional units as well as custom built designs.
Bradgate Bakery, in Beaumont Leys, UK, opened in 1993 with the belief that you should only make food that you would be proud to take home and share with your family.

By following this simple principle over the years the Bakery now employs 1000 people and is a multiple winner of the BSA’s Sandwich Manufacturer of the Year Award.

Mainly local ingredients are used to produce sandwiches, prepared salads and other chilled foods for Tesco and their own Ginsters Brand and Bradgate Bakery is one of the UK’s largest sandwich manufacturers.

Being privately owned has allowed stability to grow consistently and invest in service, people and in the modern machinery necessary to produce the high standards that they set for quality as well as health and safety.

One of the most recent investments is in a unique high efficiency, rapid start SigmaFire Clayton Steam Generator that provides steam as the heating medium for a new high quality fresh pasta line.

Clayton is also a private company that has benefited from the same type of stability and growth and the SigmaFire is an advanced boiler design that represents the progress that can only be achieved after 80 years of successful operating experience in the food industry.

The Clayton Steam Generator starts from cold in five minutes and is extremely efficient. This is due to a simple but ingenious operating principle that uses only three main special Clayton components. These are a pump, a helical water coil and a separator.

To produce steam, the cold water to be heated is pumped though the inside of a small diameter heated coiled tube and comes out of the separator at the other end as high quality steam.

This is ideal in a batch process such as pasta cooking because the steam output automatically and rapidly ramps up and down to suit the demand of the line. It also means that a high steam output can be produced from a unit that is physically very small in size.

From an environmental point of view the high efficiency and modern design means that the Clayton Steam Generator has low emissions and blowdown losses that are discharged to drain are extremely small.

Bradgate Bakery is part of Samworth Brother Limited that was founded in 1896.

The company employs 7,000 people in well-invested, modern sites in Leicestershire and Cornwall with annual sales of £700m.
Cognis, one of the world’s leading chemical companies, uses four Clayton Steam Generators to provide essential high pressure steam at 90 bar for its advanced production processes.

The Cognis Chemical Plant at Boussens, which is 70 kilometers from Toulouse was founded in 1933 and specialises in a wide range of oleochemicals. Oleochemicals are chemicals derived from renewable raw materials such as the oils from coconuts, palm kernels, rapeseed, sunflowers and soybeans. Many of the manufacturing steps at the plant require a reliable source of very high pressure steam and the Clayton Steam Generator is ideal for this type of application because of the advanced principle of operation which comes from the unique helical coil design.

In a Clayton Steam Generator water flows through a single continuous coil from the top to the bottom while heat is passed upwards in the opposite direction over the outside of the coil. This counter-flow action produces maximum thermal efficiency which results in lower running costs.

The unique coil design also means that the Clayton Steam Generator is much smaller in size and weighs much less than any other method of producing steam - and in high pressure applications the benefits are even more substantial.

The knock-on advantages of the helical coil design are the ability to safely achieve extremely rapid start-up from a cold condition as well as rapid responses to varying load demands. These features are significant in modern chemical plants which have a variety of processes running at the same time.

The four Clayton Steam Generators at the Boussens facility are Clayton Model EG-604-90 which together can produce 44 tonnes of steam per hour. They are used for five months of the year directly in the production processes and for the other seven months they become auxiliary boilers to back-up to the plant’s Combined Heat and Power system.

Three of these Clayton Steam Generators were supplied in 2002 and - due the success of the installation - Clayton were first choice when a further unit was required in 2008 to increase capacity.

Cognis is a worldwide supplier of innovative specialty chemicals and nutritional ingredients, with a particular focus on the areas of wellness and sustainability. The company employs around 5,900 people, and operates production sites and service centres in almost 30 countries. Cognis has dedicated its activities to a high level of sustainability and delivers natural source raw materials and ingredients for food, nutrition, and healthcare.
Clayton Steam Generators have been producing essential steam for the world’s largest independent provider of catering and provisioning services for airlines and railroads for the last 20 years.

If you have flown out of London’s Heathrow Airport you will probably have eaten a meal prepared by Gate Gourmet who produce 18 million meals per year - with the help of Clayton Steam Generators. They handle more than 3 million airline flights per year and are proud of their average reliability which is over 99 percent.

Before a flight can be dispatched, thousands of individual items must be provisioned to make the trip safe and comfortable for passengers. A typical long-haul flight between the U.S. and Asia, for example, requires about 200,000 items, ranging from food to equipment and amenities. Compare that with a new compact car, which typically has between 20,000-25,000 parts.

Steam is used in all areas of the modern plant for sanitization, dishwashing, and food preparation 24 hours per day and the high reliability of the Clayton Steam Generators help ensure that the continuous process of receiving, processing and despatching runs faultlessly.

One of the other advantages of the Clayton Steam Generator design in this application is the rapid response to changes in steam demand. This is particularly important to Gate Gourmet who shares their customer’s passion for on-time performance.

The Clayton Steam Generator operates on the principle of forced circulation of water through a heated coil. Only a small amount of water is contained in the steam generator which is therefore small in size and can start-up and respond to changes in steam demand very rapidly.

A feature of the design which is important in the food industry is the very high steam quality. This high quality is due to the use of a vortex type steam separator forms part of the standard design. This ensures typically less than 0.5% moisture in the steam at all load conditions.

The Clayton Steam Generator is also small in size, highly efficient and is safe to operate.

Gate Gourmet was founded in 1992 from Swissair catering. In the 1990s, as part of the SAir Group of companies, Gate Gourmet grew through acquisitions, including the flight kitchens of Aero-Chef, SAS, Varig and British Airways.

Gate Gourmet was sold by the SAIr Group in 2003 and under private ownership the company underwent a major restructuring and refinancing.

Following a number of acquisitions in 2006 and 2007, the gategroup brand was introduced in early 2008, providing an unprecedented product and service offering to the travel industry. In May 2009 was listed on the
Faced with the need for an additional high output, high pressure steam boiler - but with limited space available in the factory - the global specialty chemical company Chemetall turned to Clayton Steam Systems for the answer.

Chemetall’s Langelsheim plant is one of the largest steam consumers in the Rockwell group and two traditional firetube boilers supplied steam for the process and for heating. However during periods of high steam demand both boilers ran at full output which meant there was no back-up supply.

Jörg Matzke who is Engineering Manager at Chemetall said “If we had a failure of one of our firetube boilers or needed more steam in the winter we would end up with a bottle-neck situation. The answer for the long term was a new standby boiler for our peak load conditions.”

Because of the space limitations at the plant it turned out to be more difficult to find a solution than was originally anticipated. A firetube boiler of similar steam output to the existing units would be too large and would therefore require expensive alterations to the infrastructure. Access to the boiler as well as the associated equipment such as the hotwell, de-aerator and water treatment system had also to be considered.

The Clayton Steam Generator model EG-604 was found to be the best technology that fitted all the criteria.

Output of the unit selected is over 9 tonnes per hour of steam and it weighs only 6.9 tonnes with a height of five metres.

Jörg Matzke commented “The standby boiler from Clayton offered the best constructional, technical, and operational solution. The vertical construction of the Clayton design is a significant advantage and the unit was delivered in two parts that we were able to lower into the boiler room through a roof opening. A traditional firetube boiler with the same output is around 8.5 metres long and 30 tonnes in weight. This would have caused major headaches.”

The new Clayton Steam Generator comes into operation within a few minutes from burner start due to the rapid start capability and allows Chemetall to optimize steam production and flexibility with the advantage of having an instant standby steam supply.

The extension of existing steam installations often create space problems and the Clayton Steam Generator is the perfect solution for size, safety, reliability, fast response and steam quality.

Chemetall is part of Rockwood Holding Inc, a world class specialty chemicals and advanced materials company.

The Chemetall Group emerged from the combination of expertise in chemistry and metallurgy that is reflected in the company name.

Group activities focus on products and processes for the chemical treatment of metal surfaces and plastics and selected fields of fine chemistry.
The Nestlé factory in Ludwigsburg, Germany installed a Clayton Steam Generator in 1994 to replace one of their traditional firetube boilers and finally replaced their last firetube boiler with another new Clayton Steam Generator in 2004.

Although the process of using coffee beans to make a powder that can create an instant drink was first launched 1938 it was not until the 1960’s that instant coffee became popular in cafés and coffee shops. More recently other forms of soluble coffee have appeared, such as cappuccino, café au lait, iced coffee, Viennese blend and mixed drinks such as coffee cacao.

The method of making instant coffee starts with ground coffee beans from which a very strong, concentrated coffee is brewed. Moisture is then removed from the liquid by freeze-drying, or by spray drying to leave only the solids.

Steam plays an important part in the production process as an energy carrier, and the latest addition to the Ludwigsburg plant is a Clayton model SEOG204 Steam Generator. This has an output of 3.1 tonnes per hour and operates alongside the unit supplied ten years before - as shown in the picture.

This new steam generator is fitted with a dual fuel burner that can fire on either gas of fuel oil and the efficiency has been further enhanced by the use of an economiser that is a standard option available for all Clayton Steam Generators.

The two units are designed To operate together to meet the steam requirements of the factory. When one of the steam generators is in the standby mode it is switched off. This is possible because it takes only five minutes to reach full steam output from a completely cold condition. This gives great flexibility and allows the operator to switch the unit off and on as required to cater for changing loads.

By comparison, the old firetube boilers at the plant needed up to one and a half hours to produce full output.

The burner output and therefore the steam production on the new SEOG204 is fully modulating which is a feature that is available for all sizes of Clayton Steam Generator. This gives advantages not only with energy consumption but greatly improves accurate steam pressure control.

Another features of the Clayton design is that the heating coil is protected from the internal formation of deposits and from overheating which also ensures long life of the coil. This is done by circulating approximately 20% more water than is necessary to make steam so that any impurities from the raw feedwater are carried through to the high efficiency steam separator. This excess water is recycled.

The small size of the Clayton Steam Generator was also a significant advantage at the coffee plant since it approximately 30% of the size of a traditional firetube boiler.

Clayton Steam Generators are replacing the old traditional firetube design of boiler for many of the worlds forward looking companies.

Translated from an article in Lebensmitteltechnik November 2004.
Clayton Steam Systems have supplied Exhaust Gas Boilers as part of a remarkable major energy saving project at the Agfa Combined Heat and Power Co-Generation Plant (CHP Plant) in Belgium where heat recovery has surpassed expectations and produces a remarkable overall yield of more than 100%.

In a traditional power station - where electricity production is the main objective - a large amount of energy is lost in the cooling cycles. In a Combined Heat and Power Co-Generation Plant (CHP Plant) however, heat production is the first priority and electricity and heat are produced simultaneously. For this reason energy consumption in a CHP plant is much lower than a stand alone electricity generating power station for the same amount of electricity and the total yield is normally around 86%. At the Agfa installation it has been calculated that, based on the lower calorific value of the fuel used to power the plant, 20 megawatts of natural gas produces approximately 21 megawatts of heat and electricity.

This outstanding achievement had been possible by using engines with a high electrical efficiency and by recycling all of the available heat.

Four gas engines run simultaneously at the plant and each is fitted with a Clayton Exhaust Gas Boiler System which recovers heat in two stages to produce steam at a pressure of 20 barg and temperature of 340°C. This superheated steam is used to power pumps on the air conditioning system which requires a large amount of energy.

Further energy savings are achieved by pre-heating boiler feedwater in a waste gas economiser and from the engine block cooling. Agfa even make use of the low temperature heat from the engine intercooler as well as the low temperature stack heat. Finally the radiant heat that is ejected by the engines is recycled to provides warm air for the regeneration of air dryers in the casing rooms.

An added bonus for Agfa of installing this system is that it attracts energy saving certificates from the Flemish Energy Regulator that can be traded to other electricity producers to provide an energy savings subsidy. The Exhaust Gas Boilers were supplied in 2006 and it was estimated that costs would be recovered within two years.

The engineering specialists at Agfa concentrate on optimum use of recovered heat and integrate this technology into Agfa’s own process as well as offering their expertise to the wider industry.

Adapted from an the Agfa Technicians Newsletter by Luc Brams and Stephen Thys of Agfa-Gevaert. The full article is available on request.
The E.ON Castleford facility is a stand alone Combined Cycle Gas Turbine (CCGT) Power Station supplying electricity to the National Grid and now relies on a High Pressure Clayton Steam System every time it start-up.

As a supplier to the National Grid it is advantageous for E.ON to have the capability of being able to shut down the power station and start-up up as required for flexible operations in response to market conditions.

To achieve this E.ON needed a separate 30 barg high pressure steam supply that could be made available in an instant to feed the glands on the steam turbine - long before the main Waste Heat Recovery Boiler became available.

This instant steam would allow vacuum conditions to be established on the steam condenser and significantly reduce the time to synchronisation of the gas and steam turbines.

E.ON’s strict specifications for this application required a steam boiler that would produce a large amount of high pressure steam but which was compact in size to fit within the existing process area.

In addition, the steam boiler to be selected had to be extremely reliable since it would have to be available as, and when, it was needed as short notice.

After extensive research in 2005 E.ON finally selected the Clayton Steam Generator System which met the specification in full and is of a proven design.

The main features that make it ideal for this application are small size, rapid start capability from a completely cold condition and safety in operation. In addition the Clayton Steam Generator is automatic and it can be started and stopped remotely.

The complete Clayton Steam System was supplied as a modular plant and positioned on the existing concrete base. A weatherproof enclosure was then built around the equipment and the system was integrated into the existing process.

The Clayton Steam System has been extremely reliable and low in maintenance. The operational history has been excellent and the system can be called upon to run daily weekly or on demand whenever required.

The installation is a credit to Clayton’s innovative approach to technology and reliable engineering.
Symington’s of Leeds now use a Clayton Steam Generator to help produce a well known range of foods that originated many years ago with a remarkable invention that made it possible for soups to be made in just one minute by simply adding water and heating.

In 1827 William Symington had a vision to transform the diets of people across the country through his passion for excellent foods that were also convenient to prepare. He perfected and patented a process for the preparation of pea flour that became a mainstay in Victorian and Edwardian kitchens because it could quickly be turned into nutritious soups and broths.

The fast and convenient concept was also in the mind of William Clayton when the first Clayton Steam Generator was produced in 1930.

The design represents one of the most significant developments in steam boiler technology and enables steam to be produced in just five minutes from a completely cold condition. A significant advantage of the design is that the rapid start-up means that there is no delay before production can begin each day.

Probably One of the most famous customers for William Symington’s pea flour soup was the Captain Scott expedition to the Antarctic in 1901. The contents of one of the tins were declared to be in perfect condition when it was discovered at his last camp fifty years later.

Nowadays Symington’s is an international company with brands that are known and trusted by families all over the world. These include Ainsley Harriott, Rice & Simple, Pasta in 5, Rice in 5, Cous Cous in 5, Crosse & Blackwell, Creamola, Mug Shots and many more.

The Clayton Steam Generator is a vital part of Symington’s continued passion for the best food tastes since the steam supply for the process must be produced efficiently and must be able to cope with the varying demand of the plant.

The principle of operation of the Clayton Steam Generator is based on the forced circulation of water through a helical coil. Water is pumped through the single continuous coil from the top to the bottom while the heat from the bottom mounted gas burner travels, upwards, in the opposite direction. This counter flow heat pattern and configuration of the coil ensures a high fuel to steam ratio and hence low fuel consumption.

The most advanced equipment is now used to produce the excellent and convenient range of brands that are loved all over the world - but the philosophy embraced by William Symington has not changed.

For fast results the recipe for success of both William Symington and William Clayton were exactly the same - just add water and heat.
A well-known woollen carpet and upholstery yarn manufacturer has replaced old inefficient traditional firetube boilers with modern Clayton Steam Generators to improve energy efficiency and increase output.

Steam is a vital part of the production process at the mill and it is used to heat-set the yarn to give it the characteristic colour, texture and stability.

Heat setting is also said to impart memory to the woollen yarn so that it always returns to its original form and prevents colour from fading - essential properties of quality carpet.

The production facility runs 24 hours per day throughout the year and the two Clayton Steam Generators now operate in duty/standby mode which gives continuity and flexibility of the steam supply to the fast moving process. The low fuel consumption of the new units has reduced running costs and lowered carbon emissions at the plant.

The higher efficiency of the Clayton design is due to the principle of operation which is much different from the conventional types of firetube steam boiler that were used in the past at the mill.

Unlike their old firetube boilers design the Clayton Steam Generator does not store a large quantity of hot water under pressure and it is therefore much smaller in size and weight so there is also less mass of water and steel that needs to be heated up before steam is produced.

An added benefit of the Clayton design for producing woollen yarn is that the steam is of high quality since it is virtually dry saturated and this is ideal for the heat-setting technique.

When the standby unit is not required it is switched off but it will automatically stir into action when required since the start time is only five minutes from a completely cold condition.

By comparison their old firetube boilers took over two hours to heat up from cold and the old standby boiler at the mill had to be kept warm all of the time, consuming fuel, just in case is was needed.

The space required for the new Clayton Steam Generators is one quarter of that needed for the old boilers and the new steam system is housed in a modern plant room near to the point of use.

Clayton Steam Generators also have an enviable reputation for reliability and long life.
Campbell’s Foods were so impressed after they purchased a Clayton Steam Generators that they had no hesitation in buying a second then a third much larger one to serve a new giant autoclave - as well as all of their other kettles and Steriflow autoclaves.

Since 1968 Campbell’s Foods Belgium has been producing mayonnaise, sauces, gherkins, onion, pickles and mustard under the Devos Lemmens brand name, as well as baking products, pudding, dessert sauces and kitchen aids under their Imperial Label.

To do this, the Campbell’s Foods facility in Puurs, Belgium, need steam to cook ingredients in heat exchangers and large, covered kettles and to provide high temperatures for autoclaves that sterilize products in jars.

Peter Van Steen, Engineering and Technical Manager at the plant, explained that the old fire-tube boilers started up unacceptably slowly and their inability to maintain the steam pressure and temperature at all times made it difficult to ensure product consistency and quality.

For example, bringing a second autoclave on-line frequently resulted in a pressure drop that reduced the heat supply to another autoclave. On some occasions this meant that the contents of an autoclave had to be thrown away.

Since this was unacceptable, the plant management started looking for better alternative steam raising technologies.

During the search they came across the Clayton Steam Generator. The Clayton design is based on the forced circulation of water through a heated coil. Of particular interest was the quick start up and rapid response to changes in steam demand. At the conclusion of the research the first Clayton Steam Generator was ordered and installed at the factory.

“We were impressed right from the start,” says Van Steen. “The Clayton Steam Generator consistently maintained temperature and pressure as the autoclaves were brought on line sequentially and this guaranteed product quality.

In fact,” he continued, “the initial reaction to the Clayton Steam Generator was so good that we purchased a second one that same year.”

When a new giant autoclave was later being added to the production the management at the factory had no hesitation in selecting an even larger Clayton Steam Generator as the steam supply. On this application it became apparent that there was no loss of steam pressure, even when the largest autoclave was brought on line.

The Clayton steam systems continue to provide very good performance for Campbell’s Foods as well as consistent steam pressure levels with very little maintenance, says Van Steen.
A Clayton Steam Generator is an essential ingredient that helps produce original recipes for one of the world’s largest food companies.

The Innovation Centre for the H. J. Heinz Company in Nijmegen, Holland is their European Centre of Excellence for ketchup, condiments and sauces. Heinz constantly checks and improves recipes and develops new varieties. They also examine the quality of their ingredients to make sure they are the best.

The centre, which uses the latest equipment as well as originality and imagination to drive innovation in the food market, operate a Clayton Steam Generator to provide steam for cooking in the modern kitchen.

The Clayton Steam System was supplied in a specially designed compact 10 ft long container. The container houses the steam generator, hotwell, chemical dosing system, water softeners and all the necessary automatic controls to provide steam as-and-when required.

In addition to the small size of the Clayton Steam Generator one of the other main advantages in this application is the rapid start-up time. Clayton Steam Generators can start within five minutes from a completely cold conditions. So when heat is not required in the kitchen the steam generator is switched off completely.

Heinz was founded in Sharpsburg, Pennsylvania in 1869 by entrepreneur Henry John Heinz and is a global business employing 32,000 people and making quality great-tasting food available in over 200 countries.
The first distillery to be opened in Wales for over 100 years produces whisky using a Clayton Steam Generator.

The Welsh Whisky Company have already begun production at their Gwalia Distillery in Penderyn, South Wales and the steam is being used on a new single copper pot still that is of an advanced, highly efficient and environmentally friendly design. The still was invented by Dr David Faraday who is a descendent of the famous Victorian scientist Michael Faraday.

Steam is being supplied to the still from an equally advanced invention – A Clayton Steam Generator.

Because a whisky still is a batch process it only uses steam intermittently and is therefore a perfect application for the Clayton Steam Generator that starts in five minutes from a completely cold condition.

This means that steam is available instantly and can be fed to the still as-and-when required. After use the steam generator is switched off and does not have to be kept in a warm standby mode so no energy is wasted.

Alun Evans who is one of the directors of the Welsh Whisky Company said “We have been able to blend traditional methods with the most efficient and up to date technology available to ensure that the Whisky produced is of the highest quality possible”.

Another advantage of the Clayton Steam Generator in this application is that the quality of steam produced is the best available from any type of boiler available today. Under all load conditions the steam produced is at least 99.5% dry saturated. It therefore contains the maximum amount of energy (enthalpy) that can then be exchanged in the still.

As well as the the steam generator itself Clayton supplied the water softener and chemical dosing plant, water softener, hotwell and accessories.

All of the equipment was delivered as a skid mounted packaged unit measuring only 1.7 metres by 1.5 metres.

A natural underground water system at the distillery provides water of a distinctive quality which is the key to superior malt Whisky and only one cask is produced every day so it is also extremely rare.

Penderyn Single Malt Whisky was launched on 1st March 2004 and is now found on the shelves of supermarkets and specialist whisky shops throughout the UK and is distributed to 16 countries. The distillery also has a visitor centre where you can see the whole process of Welsh Whisky making.
EKA Chemicals Ltd, in Blackburn, Lancashire, has used High Efficiency Clayton Steam Generators since 1984.

The Blackburn factory is part of the Paper Chemicals Division of EKA Chemicals Ltd and supplies the world’s paper industry with chemicals, used mainly in the wet end section of paper manufacturing, such as sizing agents, drainage aids, retention aids or tissue softeners.

Sizing agents improve paper quality and performance on printing machines and are manufactured from rosin or synthetic wax which is treated in a number of different ways.

Steam is a vital part of the manufacturing process. It is used at the front end of the operation to melt solid rosin and wax so that it can be pumped to treatment vessels and machinery. Steam is also used in various stages of the process to maintain correct treatment temperatures.

Terry Pike who is Company Engineer at EKA Chemical Ltd said “we rely on the Clayton Steam Generator for the total production of the plant and the rapid response is ideal for coping with our varying steam demand.”

The reason for the rapid response time of the Clayton Steam Generator as well as the high efficiency is due to the once through, forced flow helical coil design.

To produce steam in a Clayton Steam Generator a positive displacement diaphragm pump forces water through a single continuous coil which is heated by means of a gas or oil fired burner. A mechanical separator at the exit of the coil is then used to effectively separate the liquid and vapour to provide high quality steam which is at least 99.5% dry saturated.

The gasses from the burner pass upwards through the coil and the water being heated travels in the opposite direction in a counterflow pattern which leads to optimum heat transfer.

Safety has also been a major factor that has contributed to the success of the Clayton Steam Generator.

Due to the relatively small amount of water contained in the steam generator it is not possible to have a steam explosion. At EKA Chemicals the Clayton Steam Generator operates fully automatically in an unmanned boilerhouse and is started by means of a time switch at around 4 am. The Clayton Steam Generator can supply 4500 kg/h at a pressure of up to 16 barg.

EKA Chemicals is part of the Akzo Nobel group and one of the world’s leading manufacturers of bleaching and performance chemicals for the pulp and paper industry. EKA has 2,700 employees worldwide and production at 36 locations in 19 countries.

Akzo Nobel is the largest global paints and coatings company and a major producer of specialty chemicals.
Baileys Horse Feeds have installed a new Clayton Steam Generator which will help maintain the finest quality products and speed up production at their Four Elm Mills plant near Braintree, Essex.

The founders of Baileys Horse Feeds are horse owners themselves who have specialised in developing feeds with particular nutritional characteristics. These are sought after for all types of horse, particularly racehorses, polo ponies, show jumpers and stud horses, at all stages of their development. The range has been shaped around the use of the most effective natural ingredients that promote health and performance.

Steam at the plant is used on the mixed feed during the conditioning process before final pelleting and packing. Conditioning at an elevated temperature allows the gelatinisation of starch to begin and this means that more nutrients can be digested. The steam also lubricates the mix to maximise the throughput and extend the life of the pelletiser die.

A feature of the Clayton design - which is important for animal feed production is the very high steam quality that is typically less than 0.5% moisture in the steam at all load conditions.

This high quality, dry steam is also of utmost importance for consistency of the product from a pelleting process since it minimises the condensate fall out in the conditioner and can also prevent slugs of water in the process. The high quality steam also reduces the possibility of impurities in the feed.

At Baileys Horse Feeds the Clayton Steam Generator is fully automatic and runs 24 hours a day with minimal operator attendance.

The company’s famous racehorse, ‘Mister Baileys’, was fed on Baileys No 10 Racehorse Mix when he won the Classic 2000 Guineas Stakes at Newmarket in 1994 - Proving that nothing succeeds like success.
A Tannery in Germany now use an unwanted waste fat by-product as a valuable source of fuel instead of paying for its disposal – and they have reduced their environmental emissions at the same time.

Südleder of Rehau in Southern Germany process over 3,000 hides per day in an energy intensive process. A significant proportion of this energy is in the form of steam that is used to heat water, dry leather and provide space heating for the production area. However, the old firetube boiler plant was inefficient and could not cope with the highly fluctuating steam demand that is a feature a modern tannery operation.

A feasibility study of the available options was carried out and this included tests on extracted animal fat from the subcutaneous connective tissue of raw hide (glue stock) which Südleder had long considered to be a potential source of fuel.

Extensive investigation and analysis was undertaken before a new system was installed that has not only reduced energy consumption but has also minimised the company’s reliance on fossil fuels. A major part of this project was the installation of a fat extraction unit and two 4900 kW Clayton Steam Generators which are capable of running on the recovered fuel.

The Clayton Steam Generator is of a remarkable design that is ideal for this type of application. To produce steam, the feedwater is pumped through a single vertical continuous helical coil in the steam generator at a controlled rate from the top of the coil to the bottom. At the same time the hot combustion gases from the bottom mounted burner pass heat upwards over the coil in the opposite direction.

One of the many benefits of this forced circulation of water through the coil is flexibility of operation since the responses to changes in steam demand occur extremely rapidly.

As well as running on the recovered fat the two new Clayton Steam Generators can burn natural gas or light oil as standby fuels. Changeover from one fuel to another happens automatically if the supply of fat runs out for any reason. Alternatively the changeover can be made manually from a touch screen display on the control panel. The light oil fuel can also be used to clear any deposits from the fuel train left behind by the fat.

An added advantage of the vertical configuration of the Clayton Steam Generator is that the heat exchange surfaces can be easily cleaned by flushing with water from top to bottom under gravity. Over time, certain light deposits from the recovered fat can form on the coil surface and it is possible to carry out the cleaning process very effectively and quickly using this method. On other boiler designs it would be necessary to perform a complete drain down which would produce a large water loss.

The animal fat is regarded as carbon neutral and will actually produce considerably lower levels of emissions that normal fuel oil. When the emission figures were verified by an independent laboratory they were found to be much lower than the ‘Technical Instructions on Air Quality’.

Südleder calculate that emissions have been lowered by 4,100 tons per year of CO₂ which is equivalent to installing thermal solar panels on 2,500 family houses!
Sellafield Limited (formerly BNFL) have installed a new self-contained steam plant at their site in Cumbria, England as part of ongoing modernisation and improvement in the way essential services are provided.

The steam supply comes from a Clayton Steam Generator which is mounted in a steel container along with all of the other necessary boiler house equipment.

The Clayton Steam Generator is compact in size and has inherent safety, reliability, and efficiency features. The reason for these advantages comes from the principle of operation which is very different from that of the conventional shell (or firetube) type boiler.

In a firetube boiler, a large mass of water is stored in a cylindrical vessel and heated to form steam. The Clayton Steam Generator, by comparison, uses forced circulation of water through a helical coil which is continuously heated to generate the steam. This means that only a small amount of water is stored in the steam generator and start-up can be extremely rapid. This method of steam production has a major knock-on safety advantage since it is not possible to have a steam explosion with the Clayton design. Gerry Rooney, Sales Manager of Clayton Thermal Products Limited who supplied the new plant said “we have been constantly expanding the range of sizes available and it is no longer necessary to choose a shell boiler where up to 10 tonnes per hour of steam is required from a single unit”.

Due to it’s small size it is possible to easily mount a Clayton Steam Generator in a standard size container along with all of the necessary ancillary equipment. This includes the feedwater tank, water softening plant, chemical treatment, pumps, blowdown tank as well as all of the essential valves and controls.

The container itself is fully weatherproof and is fitted with integral cooling for use when the plant is live - and a frost protection device which comes into action at low temperatures.

An added advantage of the packaged solution was that the complete boiler house system can be proven and tested in the factory before delivery. This was carried out under the scrutiny specialists from Sellafield Ltd to ensure that it met all of their stringent specifications.

Water is pumped through the heating coil in the opposite direction from the hot burner gasses to maximise efficiency. The outlet from the coil is then directed to a high efficiency vortex separator which produces very dry steam.

The system supplied to Sellafield Ltd is an ideal means of meeting the requirements for a readily available steam source which is safe, reliable and able to withstand a seismic event.
The Clayton Industries mobile steam plant is capable of supplying over 8½ tonnes of steam per hour in remote locations.

The complete steam system is installed in two trailer mounted containers and is designed to run completely independently of any external services.

The first trailer is the power and feedwater unit. This contains fuel and water supply tanks complete with treatment equipment. A compact electricity generator is also housed in this unit to provide the electrical supply for the essential controls, motors, cooling, heating and lighting.

Three Clayton Steam Generators are installed in the second trailer and each can deliver 1815kW of steam power. The pipework and instrumentation is designed to be readily accessible to the operator and to allow sufficient space for free movement inside the trailers.

The high steam output in such a small space is due to the compact design of the Clayton Steam Generator which is also inherently safe and efficient. This is due to the principle of operation which is based on the well known Clayton forced circulation helical coil concept.

Clayton mobile steam plants are the ideal solution where a steam supply is required on sites such as in desert or other remote oilfield applications, or where a portable supply is necessary.

Operating pressures of up to 60 barg are available as standard and constant operator supervision is not necessary.
An award winning manufacturer of dairy ice creams, bakery products and luxury confectionary has installed a new high efficiency Steam Generator to provide essential heat for their critical cooking processes.

D. Sidoli & Sons (Shrewsbury) Ltd now operate a Clayton Steam Generator at their purpose built factory in Welshpool, Wales. The factory has undergone a major expansion over recent years to cope with ever increasing demand - and the unique design of the Clayton Steam Generator will help boost production and improve efficiency at the site.

Because the manufacturing process takes place at the factory only during the day and a number of different processes operate at various times the main advantages of the Clayton Steam Generator for this application are the fast start-up time and rapid response to varying demands.

In addition to this, the space available for new equipment at the D. Sidoli factory is limited as is the case in many successful expanding businesses.

However the relatively small size of the Clayton Steam Generator meant that they were able to fit it into an existing building.

**John Taylor** at D. Sidoli said “as well as the efficiency and performance advantages which we recognised in the Clayton design, we were able to save factory space due to the small size of the complete system.”

The Clayton Steam Generator is an essential part of the production at D Sidoli & Sons and helps to maintain the regular supply of tempting deserts which offer a slice of heaven to an ever increasing number of customers.

D Sidoli & Sons (Shrewsbury) Ltd was founded in 1981 by the present Managing Director, Carlo Sidoli.

The company origins date back to the turn of the century and were in the manufacture, by hand, of ice creams, which were sold throughout the country. By developing new recipes and by using the highest quality natural products they have been able to achieve substantial growth and supply major foodservice retailers and wholesalers.