NATIONAL BUSINESS INITIATIVE

PSEE

PRIVATE SECTOR ENERGY EFFICIENCY

PROCESS HEATING

Introducing energy saving measures for business

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Preface

Reducing energy use makes perfect business sense; it saves money, enhances corporate reputation and helps everyone in the fight against climate change.

The Private Sector Energy Efficiency (PSEE) programme provides simple, effective advice to help businesses take action to reduce carbon emissions, and the simplest way to do this is to use energy more efficiently.

This technology overview of process heating introduces the main energy saving opportunities for businesses and demonstrates how simple actions save energy, cut costs and increase profit margins.

Contents

Energy consumption

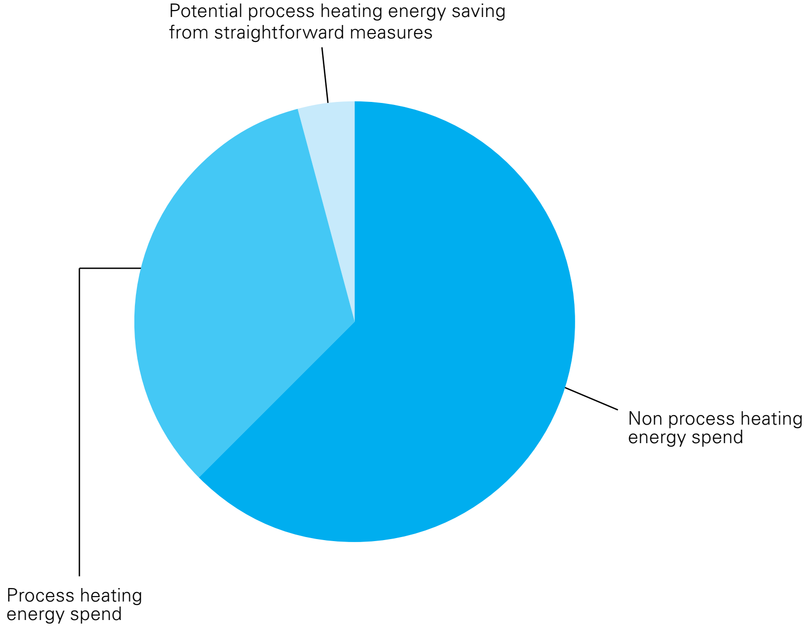
Almost all industrial production will require some form of process heating.

Process heating is a general term that refers to the various types of heat transfer techniques used in industrial production. Process heating is used for a diverse range of activities including distillation, evaporation, drying, extraction, curing, heat treating, melting and providing the heat for endothermic chemical reactions. The diverse nature of these activities means they are used throughout a wide range of industrial sectors, from laundries and food production to chemicals and foundries.

This publication summarises where energy savings can be made by improving working practices and by upgrading processes, technologies and equipment. General energy saving techniques applicable to all forms of process heating are shown, as well as those related to specific process heating techniques. This overview provides an introduction to the savings opportunities for production, engineering and energy managers. However, this is a complex topic, and so you may need to seek further expert advice from suppliers or consultants to put some of the recommendations into practice. For further help, contact PSEE on 0801 113 943.

Saving energy is one of the simplest ways to increase profits.

Figure 1 Typical saving in process heating energy use as a proportion of total industrial energy use.



Fact

South African industry spends around R165 billion on energy every year, which equates to approx. 300 TWh.

Typically, around 40% of the industrial energy is used directly in process heating. Using straightforward techniques, between 10% and 20% of process heating energy could be saved, potentially reducing energy consumption by 10-25 TWh annually.

Process heating in industry

Types of process heating

Process heating is a diverse area and this section lists some of the more common process heating techniques and the sectors in which they are frequently used.

There are two types of change that are driven by process heating:

- **Physical change** – such as melting and evaporation.
- **Chemical change** – such as baking, cooking, heat treatment and chemical production.

A third area, which might be considered separately, is that of cleaning and sterilisation which includes both aspects.

Delivery of heat to industrial processes has two key aspects: release of heat from a fuel and transfer of this heat to the process.

Fuels

There is a wide range of fuels used in process heating applications including: electricity, coal, various oils, LPG and natural gas. For some processes specific fuels must be used; for others there is flexibility.

Heat delivery

Heat is transferred to the process by a range of means. Examples include:

- Heat transported in flue gases heated directly by combustion of fuel.
- Heat transported in hot water or steam generated in a boiler.
- Heat transferred by radiation from electrical heating elements.
- Heat is transported in air heated indirectly from combustion gases via a heat exchanger.

Each process heating application requires both fuel and a heat delivery mechanism. In this guide these combinations are termed heat sources.

Temperature bands for process heating

There is no formal differentiation between processes on the basis of the temperature range in which they operate. However, for convenience in this overview they have been divided into three bands: low, medium and high. The divisions approximate to types of heat delivery. Although certain process types may frequently fall into a particular band, the type does not necessarily indicate which temperature band an individual operation will fall into.

Some processes cover a wide range of temperatures such as the distillation of crude oil, with various fractions being collected at temperatures from below 30°C (gases) up to greater than 600°C where the vacuum residue remains.

Table 1 ***Processes and heat sources for different temperature bands***

Temperature band	Heat delivery	Processes
Low <250°C	Hot water	Cooking
	Hot air	Baking
	High pressure hot water	Drying
	Steam	Evaporation
		Laundering
		Sterilisation
Medium 250-600°C	High pressure steam	Forced air drying
	Thermal oil	Distillation
	Direct firing	Heat treatment
	Indirect electrical heating	Annealing
		Chemical processing
High >600°C	Direct firing	Catalytic and steam cracking
		Firing ceramics
	Direct electrical	Smelting
		Glass melting
		Arc furnaces

Sources of process heat

There is a range of drivers for businesses selecting the energy source and heat delivery medium for processes – temperature, fuel availability, throughput, product requirements, initial cost and operational safety among others. Each option may provide energy saving opportunities, which can be explored.

Warm air

Warm air can be generated directly by electricity or indirectly by combustion of coal, oil or gas. It can also be produced from heat exchange with steam or with waste-gas streams from higher temperature processes. The generation of warm air varies in efficiency depending on the method used.

As a heating medium, air is limited because of its low heat capacity and its relatively low heat-transfer coefficient. However, once produced, it is a relatively safe, reliable and clean source of heat with no fouling of heat transfer surfaces. Because of this, it is a popular heating method for a wide range of applications.

Warm air is generally used for the lower temperature ranges of process heating, such as for drying activities where it supplies heat and acts as the carrier gas to remove water or other solvents from a product.

Hot water

Hot water can be produced by electricity or any fossil fuel.

It can also be produced by heat exchange with process fluids, as well as from waste heat. The efficiency of its production will vary with the method of heating and with the efficiency of the water-heating equipment.

Water has a large capacity for retaining heat, which makes it more useful than other media, such as air. However, unless it is held under pressure, water has a maximum heating temperature, which is limited to below 100°C, to avoid boiling. This limits the range of activities for which water can be used as a heat-transfer medium. However, it is a relatively easy and safe heating medium. Any problems with the use of water tend to be associated with leakage from the distribution pipework, fouling of heat-transfer surfaces and corrosion of metal surfaces.

Thermal oil

Thermal oil is usually used where temperatures higher than those which can be readily attained using water are required. Problems with leakage are rare as these systems must be rigorously maintained due to the hazard presented by escaped oil. These systems are unlikely to suffer from corrosion or fouling on the oil side as the oils do not contain components that will cause these problems.

Energy saving opportunities for water, air and oil are discussed on page 11.

Steam

Steam is the most widespread process heat delivery medium. It is produced from the combustion of fossil fuels in boilers or as an output from a combined heat and power plant. A significant proportion of fossil fuel used in industry is for the generation of steam. Steam can transfer and deliver considerable energy through condensation releasing the latent heat of evaporation. A key benefit is that heat is delivered at a fixed temperature, as condensation occurs without a temperature change. Superheated steam contains even more heat than saturated steam.

Steam production efficiency will depend on boiler efficiency. The main advantages of using steam are its high heat capacity and flexibility. The main disadvantage is that it tends to be expensive to produce due to inefficiencies in the operation of the boiler and in the distribution system. There are several factors that affect boiler efficiency, including burner performance (which determines combustion efficiency) and blowdown. Blowdown is necessary to prevent excessive boiler fouling but, when overdone, it leads to significant energy loss. Heat losses from steam distribution result from inadequately insulated pipework and steam leaks usually through failed steam traps.

Energy savings opportunities for steam are discussed on page 15.

Top Tip

When setting up a heated process, consider the energy consumption over the plant's lifetime – the right decision at the beginning could save money for years to come.

Direct combustion heat

Direct combustion heating, using coal, natural gas or fuel oil, is used in many medium and higher temperature process-heating applications such as rotary kilns, which break down some types of metal ores. The main advantages of this form of heating are the efficiency of heat transfer and the rapidity of response to heat input changes. Its main disadvantage is that the by-products of combustion can contaminate the product.

Indirect combustion/electrical heating

Indirect combustion heating is where the combustion process is separated from the material to be heated by a wall or tube. Many furnaces operate on this principle. Burners fire into a combustion chamber and heat is then transferred through the walls of the furnace chamber to the material to be heated.

The configuration of the furnace chamber depends on the process. Often it will include pipework passing through the combustion chamber. Alternatively, the combustion chamber is itself a tube which passes through the furnace chamber and radiates heat into it. Similar approaches can be taken for heating tanks with a combustion tube passing through the fluid held in the tank.

This process is less efficient than direct combustion heating, but prevents contamination of the material with combustion products. It can also be used where a product is flammable, but consideration must be given to the risks associated with the failure of the furnace chamber wall or pipework containing the material. The technique is used extensively in oil refineries and the organic chemicals sector. Indirect electrical heating is also used, where a tube containing heating elements passes through the furnace chamber or liquid tank.

Energy saving opportunities for direct and indirect combustion heating are discussed on page 17.

Direct electrical heating

There are various direct electrical heating techniques.

Arc furnaces use electric current to heat metals directly. For example, they are used to convert solid raw materials to liquid crude steel as fast as possible and for further refining in secondary steel-making processes.

Induction furnaces are used to heat a range of materials including metals and glasses (for drawing optic fibres). Their function is based on the effect on materials placed in an electric coil. Very high temperatures up to 3,400°C can be achieved in inert atmospheres.

Heating with microwaves (or radio frequency energy) is possible for some types of material. It relies on the material being polar, and water is the material that is most commonly heated by this means. The presence of water (either free or bound) in a huge range of materials enables this technique to be applied to them.

Case study

Use of waste heat for drying

A textile manufacturer, specialising in the production of synthetic carpet yarn and the production of woven nylon containment nets used in the fish-farming industry spent R3 million annually on energy, a significant overhead. The net-drying process was carried out in steam-heated drying chambers and, knowing that the older plant and systems were inefficient, the company made the decision to reduce energy consumption by changing the drying process. The company now uses waste heat recovered from the large air compressors at the site to dry the nets. This resulted in cost savings of more than R300,000 and annual energy savings of over 3 million kWh.

Opportunities for saving energy

General actions

Regardless of the application, there are a number of general actions that can save money and energy.

Control the process

- Do not let processes operate at a higher temperature than necessary. The rate of heat loss to the atmosphere increases as temperature increases, so maintaining the lowest effective temperature will save energy.
- Check that utilities are not left on when the process is not running, especially overnight or at weekends. Similarly, ensure that processes are not running for longer than necessary or that the product is not being over-treated. This is a fairly common occurrence.

Maximise utilisation

In general, the longer equipment can be used continuously, and the nearer to maximum capacity it runs, the more efficient it will be. Hence, try to avoid numerous short production runs which will require extra heat during start-up or shutdown.

Insulation and minimisation of evaporative losses

Process equipment can lose a considerable amount of heat energy. Losses occur through the radiation of heat from hot surfaces or equipment, from the materials being processed or from the evaporative cooling of liquids.

Losses can be reduced considerably through insulation, either by insulating the outer surfaces to prevent radiant heat loss or the internal surface to prevent conduction to outer surfaces. A third option is using covers to prevent evaporation.

Top Tip

Drying

Many products – examples include textiles and food products – have a natural moisture content. If they are over-dried, they will simply absorb moisture from the air until they reach their natural moisture level, making over-drying pointless and wasteful. Energy savings can be made by making sure that products are not dried beyond their natural moisture level.

The two examples below show how minimising losses can provide considerable savings.

Ladles – in foundries, the energy consumption of systems with ladles (typically <10 tonnes [1]) without hoods is notoriously poor. A substantial improvement can be made by fitting a refractory hood or cover to reduce heat losses and cold air ingress. Inserting a thermocouple temperature sensor in the hood and using the output as a feedback control to the airflow valve controlling the firing rate of the burner to avoid overheating will produce further savings.

Dipping – evaporative energy losses from heated liquids can be controlled by covering the opening of the vessel. Where this is not practicable, for example in dipping processes, cover the surface of the liquid with a layer of insulating spheres which displace as the products are dipped and removed from the bath, and then reform to produce the insulating layer.

[1] Heat losses from the small ladles used by the foundry industry are proportionally greater than the losses from the large ladles used in the steel industry.

Waste heat recovery/ pinch technology

Heat recovery is the re-use of waste heat from a process to reduce the energy consumption of the process itself, or to provide heat for other processes or systems such as space heating. Identify and quantify heat wastage. Make sure that the opportunities to recover and re-use waste heat are maximised – significant energy savings can be made for a particular process by recovering valuable heat from waste process effluents and using it for another purpose such as preheating incoming process water.

Pinch technology is an analytical method that can be applied to produce an optimum heating and cooling scheme, which maximises the energy savings. For further information, contact a consultant who specialises in this technique.

Case study

What are other companies doing?

At one foundry, a 59% improvement in efficiency was achieved by fitting refractory hoods to ladles and using thermocouple temperature sensors.

Metering, monitoring and targeting

Monitoring energy consumption establishes current energy consumption patterns, including identifying areas of high use and potential wastage. It also allows comparison of energy use over time. Therefore, metering and monitoring can enable identification of the best energy saving opportunities and allow tracking of improvements.

To understand energy use effectively:

- Meter energy use.
- Collect data.
- Interpret it effectively.
- Use it proactively – monitoring use and setting targets for improvement.

Any metering used needs to be appropriate to the process type.

Good maintenance

Regular maintenance of process heating equipment will minimise losses. Design a planned, preventative maintenance schedule with the help of a service engineer.

Did you know?

You can make energy savings of up to 20% of dryer costs by correctly maintaining door seals, the condition of insulation and/or using the correct pressure control. Also, utilising the hot exhaust from the kiln/furnace cooling process is a well-established technology that will save energy.

Consider alternatives to process heating

Consider alternatives to conventional process heating, such as mechanical dewatering, microwave drying or using lower temperature processes.

Mechanical dewatering – a range of techniques can be used to reduce water content prior to final drying. These include techniques such as filtration, centrifugation and aerodynamic separation. In general, these processes are much lower in energy requirement than process heating for removal of an equivalent amount of water, because evaporation is not involved. A thermal process will probably still be required for final drying of a product.

Microwave processing – although this is an energy-intensive technology, the energy can be delivered in a targeted way, reducing overall energy use requirements.

Lower temperature processes – reviewing alternative approaches to making a product may enable less energy intensive routes to be identified. For example, for a particular chemical product, there may be several synthesis routes available. Selecting one where catalysis is used to reduce the reaction temperatures required may enable significant energy savings to be made.

Case study

What are other companies doing?

Thermal drying is a very energy-intensive method of removing moisture. To save energy, consider removing as much water as possible by mechanical means prior to thermal drying. A carpet tile cleaning company found that by stacking tiles vertically instead of horizontally a lot of water was removed simply through natural drainage. This significantly reduced the time and energy used for thermal drying, and improved throughput for the company.

Warm air, hot water and thermal oil

Reduce heat delivery rate

Heat delivery rate is a function of the temperature, heat capacity and flow rate of the heat delivery medium. For heating using air, water or thermal oil, there may be scope to reduce the amount of heat delivered to the application. Opportunities for energy savings can be identified by checking temperature and flow against requirements. If the temperature of the heat delivery medium (air/water/thermal oil) at the exit to the process is similar to its supply temperature, then it is probable that its flow rate is too high. Reducing the flow rate may also reduce energy use for pumping. If there is scope to reduce the process operating temperature, reduction of the supply temperature of the heating medium may be possible. First check that these actions will not compromise the process, and that heating requirements will continue to be met.

Carry out maintenance

Hot water or oil heaters require regular attention as part of planned maintenance. Check that heat transfer surfaces are clean and fuel burners, if used, are operating efficiently. If maintaining the heater has become too costly or time-consuming, consider replacing it with a newer, more efficient model.

Reduce process load

Examine the process itself to see if the heating load could be reduced. Can the heating be turned off at weekends, overnight or during the day when the process is not operating? Can scheduling of production loads be adjusted to optimise utilisation of the system? Simple changes to the design of the process may be possible to allow the heat load to be reduced.

Look for opportunities to use waste heat from the plant to part heat or fully heat the process hot water or thermal oil. Low temperature process heating offers the greatest opportunity for the use of waste heat.

Check and repair insulation

To keep heat in, ensure that hot surfaces are lagged wherever possible. Consider replacing the existing lagging if it is not of the current recommended thickness and note missing, damaged or wet sections which should be replaced promptly. Find and deal with the source of any water damage in the lagging. Thermographic surveys may speed up the process of checking lagging by identifying areas of higher heat loss. Specialist companies carry out these surveys and provide advice on best practice for lagging.

Case study

Energy and cost savings in hot water boilers

In many boilers used to provide an ongoing supply of hot water, the water continues to flow through the system even when the boiler is not being fired. This practice is inefficient – heat is lost to the natural draught flowing through the boiler. A project at a Hospital successfully reduced these losses. An automatically closing isolation damper fitted in the flue stack prevents the natural flow of air through the boiler when it is not being fired.

Switch to condensing boilers

Condensing boilers are highly efficient and are particularly suited to producing low temperature process heat. Consider the viability of changing an existing boiler, particularly if it is more than ten years old, for a new condensing boiler. The benefits of condensing boilers are greatest where return temperatures are low. Where process requirements lead to return temperatures greater than 50°C, the benefits are limited and a high efficiency conventional boiler may be more appropriate. External consultants will be able to assess the viability of this option.

Process steam

There are many opportunities for savings from steam generation, boiler operation and distribution systems. These are summarised below.

Steam generation and boiler operation

Keep up to date with maintenance – check that the boiler is operating in peak condition, with good control. Keep boilers well maintained, particularly attending to the heat transfer surfaces.

Check air/fuel ratio – incorrect air-to-fuel ratio can lead to excessive fuel consumption, poor combustion and possibly illegal emissions. This is unlikely to be a problem for modern gas burners; however, for older oil or solid fuel fired boilers there is a greater risk of poor combustion. Consult a boiler or burner maintenance technician to check the ratio.

Insulate the boiler – carry out an insulation survey, either in-house or through a consultant. Pay particular attention to old boilers which often have damaged or inadequate insulation.

Review blowdown operation – typically between 1% and 5% of energy input to the boiler is lost in blowdown operations. Optimising the blowdown regime by, for example, switching from manual to automatic control can make considerable savings. (see 'Did you know?' box).

Fit economisers – economisers reduce energy use by using the heat from the outgoing hot flue gas to warm the incoming feedwater or to heat water for other uses. Fitting economisers is an excellent way to reduce the loss of heat and save energy.

Install variable speed fans – the control of airflow is traditionally achieved by dampers interrupting the flow of air from a fan working at full load. Installing variable speed fans to match the airflow to the burner requirements can make energy savings. This will also reduce the mechanical wear on system dampers and reduce maintenance requirements.

Consider a new boiler – if the boiler has been in use for a number of years, it may be worth switching to a new, more efficient boiler, possibly of an alternative design. A manufacturer or consultant will be able to advise on whether this would be a viable action.

Select the best burner – when replacing, consider carefully the options available and

Did you know?

The National Environmental Management: Air Quality Act (No. 39 of 2004) contains provisions relating to the control of dust in all areas and measures for the prevention of pollution and ecological degradation. Through the Act, standards are set for particulate matter and substances released by combustion installations and certain fuels are prohibited from being used during the manufacturing process. Visit http://www.gov.za/documents/national-environmental-management-air-quality-amendment-act for more information.

select the most efficient. New burner designs may have become available since the current boilers or burners were installed, which could save energy and money. Seek expert advice when comparing burners.

Consider combined heat and power (CHP) – a CHP plant is an installation where there is simultaneous generation of usable heat and power (usually electricity) in a single process. Because of this simultaneous generation, the use of CHP can have significant cost and environmental benefits under the right circumstances. A consultant can review the viability of this technology and identify the most appropriate CHP solution.

Steam distribution

Steam is expensive, so a plan for ensuring it is not lost or wasted can save money.

Check for leaks – make sure steam is not escaping through traps, pipework, flanges and joints.

Insulate – all steam pipework should be insulated to prevent heat losses.

Identify redundant pipework – 'dead legs' of redundant pipework are a source of unnecessary heat loss, so have an expert find them and seal them off.

Check steam traps – a major source of steam loss is through 'failed' steam traps. Inspect steam traps as part of a regular distribution network survey and take corrective action if any are defective.

Use the heat in condensate – steam condensate from the plant is a valuable source of heat typically containing 20% of the heat used to generate the steam. Where possible, pipe it back into the boiler feedwater, thereby reducing the energy load on the boiler and conserving water.

Decentralise and rationalise steam supply – see if there are opportunities to replace the central system with individual point-of-use sources to give greater control over energy use. The greatest benefit is that energy losses from the steam distribution system are largely eliminated by removing it.

Case study

Use of flash steam and steam trap maintenance

A tyre manufacturer uses steam for its process heating requirements. A programme to re-use flash steam and maintain steam traps resulted in a 16% fuel saving and a payback period of ten months.

An additional benefit was an 80% reduction in boiler water make-up and chemical treatments costs.

Direct and indirect combustion heating

Compare energy use

The first step is to analyse any historical energy and production data, and compare usage with current performance. Investigate whether reductions are feasible. See page 12 for information about monitoring and targeting.

Check burner operation

The next step is to analyse combustion gases in the furnace exhaust. These levels are often measured automatically via a detector located within the flue. If the oxygen content is too high compared with design specification (usually between 2% and 3% on a dry basis), check for air infiltration and examine the air/fuel ratio of the burners. If there is incomplete combustion (evident from high levels of carbon monoxide in the flue gas), check the air/fuel ratio, that fuel oil atomisation is satisfactory and the air/fuel mixing is effective. Investigate the viability of installing oxygen trim control. There may be on-site expertise available to carry out these checks or a consultant may need to be employed.

Process heat recovery

Consider whether there is scope to upgrade burners to operate with significant levels of combustion air preheating. Preheating combustion air with waste heat from furnaces is particularly effective where the furnace gas temperatures exceed 1,000°C and can be economic even at lower temperatures. A specialist consultant could be employed.

Recovered heat can also be used for other purposes such as preheating or drying process materials, thus providing significant energy savings.

Carry out a process integration study

Formal analysis of the heating and cooling demands of a plant will reveal whether savings can be made from their optimisation. There are a number of consultancies that carry out process integration studies, including 'pinch' analysis (see page 12). The results of the study will identify the modifications required to optimise the set-up.

Check process requirements

Process requirements should also be checked. Energy savings can be made through changing process conditions, but it is important to be sure that these changes will not affect product specification or compromise process safety. It may be necessary to seek expert help to check this.

Process conditions that could be altered in certain cases to reduce energy use include:

Temperature of operation – temperatures may be higher than necessary, leading to unnecessary energy losses. Check recent operating temperatures against specification and reduce them if feasible.

Time at temperature – the time the process is held at processing temperature could be longer than necessary. Check recent operating times against specification and reduce times if feasible.

Rate of heating – it may be possible to increase the heating rate and reduce the overall time at an elevated temperature. Check recent rates of heating (and cooling) against specification and change if feasible.

Temperature uniformity – there may be problems in keeping heating-zone temperatures uniform due to faulty temperature sensors or control systems, leading to the need to operate at higher temperatures than necessary in parts of the furnace or kiln. Investigate any variability in temperature and eliminate if possible.

Throughput/loading – there may be ways to increase throughput or furnace loading, leading to increased furnace or kiln utilisation and reduced energy consumption per production unit.

Scheduling – it may be possible to change scheduling to allow more efficient use of the furnace or kiln, for example, running longer campaigns at elevated temperatures rather than intermittent batch use.

Glossary

Air/fuel ratio	The ratio of the weight, or volume, of air to fuel.
Blowdown	The periodic removal of water from a boiler to remove dissolved and suspended solids concentrated in the water.
Combined heat and power (CHP)	A plant designed to produce both heat and electricity from a single heat source.
Condensing boiler	A type of boiler that uses an extra-large heat exchanger to achieve very high efficiencies (90%+). Heat is recovered successfully from the flue gases such that they are cooled to a temperature where the water vapour starts to condense out.
Curing	Curing is the toughening or hardening of a polymer material by cross-linking of polymer chains brought about by chemical additives, ultraviolet radiation and/or heat.
Dead leg	Section of a pipework system that is no longer used to deliver steam for use.
Drying	Drying is the removal of water or solvent from a solid product. This includes both 'free' or 'surface' moisture and 'inherent' or 'bound' moisture.
Economiser	An economiser is a heat exchanger that transfers heat from the hot flue gas of a boiler to the water being fed into the boiler.
Flash steam	The steam produced when the pressure of hot condensate is reduced. This steam can be used for lower grade heating requirements.

Heat recovery	The recovery of waste heat from a process, which can then be used elsewhere, such as for space heating.
Heat transfer coefficient	An indicator of the resistance to heat flow across a medium.
Lagging	Insulation applied to the outside surfaces of process equipment, pipework and ducting carrying heat delivery media such as steam or water. It is made from a variety of insulating materials, commonly mineral wool.
Laundering	The process of washing and drying clothes and other textiles.
Oxygen trim control	Oxygen trim control systems monitor the combustion process and use feedback control to closely regulate and maintain programmed air and fuel flows.
Pinch technology	An analytical method that can be applied to produce an optimum heating and cooling scheme, which maximises the energy savings.
Preheat	Heating a material before it enters a process including materials for processing and combustion air for process burners.
Steam traps	An automatic valve that releases condensed steam (condensate) from a steam space while preventing the loss of live steam. It also removes air and non-condensables from the steam space.
Thermal oil	Mineral oils used as heat delivery media, also referred to as hot oil or thermal fluid.
Thermographic survey	Use of infrared imaging to identify points of heat loss from equipment and buildings.

Next Steps

There are many options to help save money and improve the operation of process heating. Considerable savings can be made by taking action in-house. However, specialist support from a contractor or consultant may be needed to investigate or implement other areas of improvements.

Step 1 Understand your process heating requirements

The first stage is to understand the heating requirements of your process. Identify the types of process heating you use and understand the advantages/disadvantages and potential savings associated with each type.

Step 2 Measure and monitor your energy consumption

Measure the current energy consumption of your process heating systems and compare these to production performance. Can you identify any energy saving opportunities that could be investigated? These data will also provide you with a baseline against which to set any energy saving targets and measure any improvements.

Step 3 Identify and prioritise your actions

Think about the most appropriate actions you can take. Are there any easy no and low-cost measures that could be implemented now? Carry out any cost benefit studies to assess the feasibility of longer-term activities.

Step 4 Seek specialist help

If needed, seek advice from service engineers and consultants to ensure the optimal operation and appropriate maintenance of your process heating equipment. Further advice may also be available from the PSEE.

Step 5 Make the changes and measure the savings

Put in place the energy saving actions. Measuring the savings through continuing to measure energy consumption compared with performance, will enable you to track the improvements in your process.

Step 6 Continue to manage your process heating systems for energy efficiency

Put in place policies, procedures and systems to ensure that systems operate efficiently and that savings are maintained in the future.

Plug into energy efficiency with PSEE

The Private Sector Energy Efficiency (PSEE) project aims to improve energy efficiency in industrial and commercial sectors across South Africa. PSEE offers a variety of services to help companies plug in to energy efficiency:

Website – Visit us at www.psee.org.za for our full range of advice and services.
↘ www.psee.org.za

Remote advice – Call us on 0801 113 943 or visit www.psee.org.za to access independent, authoritative advice and our publications and tools.

Publications – We have a library of publications detailing energy saving techniques for a range of sectors and technologies.
↘ www.psee.org.za/Resouces

Survey-based support – Review of energy use for medium-sized companies to identify energy savings opportunities and develop a suggested implementation plan.
↘ www.psee.org.za/Services/Medium-Companies

Case Studies – Our case studies show that it's often easier and less expensive than you might think to bring about real change.
↘ www.psee.org.za/Resouces

Strategic energy management – Holistic engagements for large companies to help improve operational energy efficiency and support the development of a comprehensive energy and carbon strategy.
↘ www.psee.org.za/Services/Large-Companies

The Private Sector Energy Efficiency (PSEE) programme aims to improve energy efficiency in commercial and industrial companies in South Africa through the provision of various services to assist companies in identifying and implementing energy saving measures. The PSEE programme is implemented by the National Business Initiative (NBI), supported by the Department of Energy, and funded by the UK Department for International Development (DFID).

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