Appendix C6 – rev. 1
Energy

1. Site Energy Usage

For a 12 month period May 2020 to April 2021 the installation used a total of 26,460,339 kWh. For the same period the site has an output tonnage of good product of 2,186 tonnes.

Table 1.1: Site energy usage for 12 month period May 2020 to April 2021

Site	Electricity kWh	Gas kWh	Propane Kwh	Gas oil kWh
Foundry site	7,592,276	10,360,613	437,940	261,326
Jubilee site	1,944,881	5,863,303	--	--
Total	**9,537,157**	**16,223,916**	**437,940**	**261,326**

Gas oil is used only in mobile plant. The plant is refuelled on the Foundry site but operates across both sites.

The Jubilee site energy use includes a small amount of energy that is consumed by another parent group Company that occupies part of the Jubilee site.

The installation routinely monitors its specific energy consumption (SEC) per tonne of good product. Based on the above figures this gives an SEC for the period May 2020 to April 2021 of 12,104 kWh per tonne of good product.

The factors significantly affecting the installation's energy efficiency, as measured above, are detailed further below together with the current controls in place.

2. Casting yield

Steel castings require a method, a term which collectively covers the system of runners, risers, feeder heads and other additional metal that are designed into the mould. This method is designed to ensure the when the casting is poured it fills in a manner that is not deleterious to the casting; and that as the liquid metal cools and shrinks it does so in a manner that causes no or as few as possible volumetric defects. This method is designed according to the relevant specification (defined in this context at para 1, Appendix C1).

Therefore the casting yield is the total weight poured into the mould including the method versus the total weight of the casting without the method.

Each particular type of casting will have its own method. The over-riding aim of the method is to firstly produce a sound casting and secondly to do so while maximising the yield for that particular casting.

The installation closely controls and monitors the method for all sand-moulded castings. The method is computer simulated and the simulation is reviewed, refined and signed off by competent persons. Issues identified in the production run of castings are identified either at the first casting stage or during the casting run and information passed back to the Technical Department for formal review of the method. This takes place within the framework of a formal quality system.

The installation has invested significantly in the last 5 years in the equipment, software and competence needed to ensure the sound methoding of castings.

Yields are closely monitored and are part of the method approval process. The average yield achieved across a year needs to be interpreted as the type of castings made always varies from order to order and therefore throughout that year.

3. Scrap and re-work

Scrap and re-work can significantly affect the SEC / tonne figure.

Scrap is not counted to the good tonnage figure by which energy consumption is judged, even though that energy was used to produce the tonnage.

Re-work may involve fettling, cutting and welding activities but may also require castings to be pre-heated to prevent physical damage to the casting or for the casting to be re-heat-treated to ensure its final physical properties meet the requirements of the specification.

Re-work and scrap is routinely monitored, analysed and root cause analysis undertaken and this takes place in the context of a formal quality system.

The installation has in the last two years invested heavily to automate the collation and analysis of the raw data to enable prompt and routine action to be taken in terms of identifying root causes and monitoring the scrap and re-work percentage.

4. Energy efficiency in the melting process

The installation is a jobbing foundry with an order book and weekly production programme that can vary significantly from week to week.

The melting process is routinely planned on a weekly basis and reviewed daily to make the best use of the sequencing of melts taking into account the delivery and lead times to be achieved, the moulding capacity available, the types and sequence of alloys to be poured, and the weights and quality of molten metal required and the differing types of furnaces needed to achieve these. Furnaces and ladles are pre-heated according to this programme.

The reason for this A2 application is the investment in two off 20 tonne induction furnaces which take the installation's production capacity in to the A2 bracket for environmental permitting. The installation of these furnaces is primarily market led but they will deliver significant energy (and other resource) savings over current melting practices, where several existing furnaces are required to be used in combination over extended periods of time to achieve the weight of molten metal called for.

5 Energy efficiency in the heat-treatment process

Many of the castings produced require thermal processing in the form of heat-treatment. Heat-treatment involves thermally treating castings to a defined thermal profile which changes the metallurgical structure of the casting. Heat treatment is used to either alleviate physical stress in the casting caused by its cooling characteristics when it is first poured, or to give the casting the physical properties required by the specification. The thermal profile can vary significantly according to the grade of steel produced.

Heat-treatment for every casting is carried out to a specified thermal profile in computer controlled and monitored kilns. Castings requiring similar thermal profiles are grouped together where possible

to make the best use of each kiln. The heat-treatment programme is largely dependant on the throughput from the casting programme. Kilns are routinely inspected to ensure their insulating refractory linings remain efficient.

The amount of heat-treatment required will vary for each casting contract according to the specification. For example, some specifications will require several heat-treatments of the same casting, whereas some specifications may only require one.

Additionally, the installation has invested significantly in its own on-site heat-treatment facilities to bring in-house a significant quantity of work that was previously sub-contracted off-site. This has complicated the assessment of the SEC of the installation.

6. Energy efficiency in the supply of compressed air

Compressors operate under a SmartAir system that utilises a variable speed Compressor to delivery air as efficiently possible. Compressed air leaks are dealt with as part of routine site maintenance. Compressors are routinely maintained under a service contract.

7. Additional factor affecting SEC: Total good tonnage output from site

Total good tonnage has a significant affect on the SEC efficiency figure. When this output figure drops significantly below 2,500 tonnes the SEC figure increases disproportionately as there is a certain base-load energy requirement of the site based on its weekly production planning cycle. Good tonnage output has declined in recent years (see section 11 below) and this has caused the SEC figure to increase.

8. Additional factor affecting SEC: Metal melted for feed-stock

The installation produces feed-stock. This is metal produced to a specification which is cast into pieces, usually on a pig-casting machine, that can be supplied to other foundries for use as feed-stock for their furnaces. The production of this feed-stock is interlaced with other castings to be produced, as described in the production planning processes above (section 4 above, and section 4 in Appendix C1).

This feed-stock work does not utilise equipment in the moulding, heat-treatment or finishing departments and is therefore less energy intensive than other types of castings. The order input for this activity is variable and as it increases it reduces the SEC figure for the installation. The volume of this work has typically varied between c. 10% to 40% of the good tonnage output and this needs to be taken into account when assessing SEC.

9. Site lighting

For several years the company has had a policy of replacing traditional high-bay metal halide bulbs (typically 0.4kWh) with LED type lights (typically 0.15kWh) of greater energy efficiency. This has been carried out as and when bulbs fail and there is an opportunity to get access to the area to change the type of light.

11. Climate Change Levy Agreement

The installation operated under a climate change levy agreement until regulatory changes afforded exemption to energy intensive industries from this levy agreement.

12. Energy Savings Opportunities Scheme 2014 (ESOS), as amended

As a wholly owned subsidiary of a PLC company (Goodwin PLC) that has obligations under ESOS, the installation is subject to routine energy audits and identification of energy saving opportunities.

13. Energy Policy

POL001 - Management Policy **Environmental, Health, Safety, Energy and Quality** Page 1 of 1

Goodwin Steel Castings Ltd (The Company) is a subsidiary company of Goodwin PLC. It operates as a foundry manufacturing steel and nickel alloy castings. The process includes the production of liquid metal, casting into sand moulds, processing and inspection of these castings. Components weigh from a few kg up to 40,000kg.

Its objectives and strategy are aligned with those of Goodwin PLC in relation to cast products.

The Group's main objective is to have a sustainable long term engineering based business with good potential for profitable growth while providing a fair return to our shareholders. The company's strategic direction flows from this objective.

The nature and scale of its Environmental, Health, Safety, Energy Quality and manufacturing risks are those associated with the foundry process. Goodwin Steel Castings recognizes that the control or elimination of these risks are an essential element in the operation of a successful and sustainable business.

- The Company's management system shall ensure all operations comply with relevant legislation and regulations and to all other requirements which the company may adopt, including consistently meeting the needs and expectations of its stakeholders and customers.
- The appointed management representatives shall ensure the company's operations meet the requirements of this policy. The company will provide the necessary mechanisms and resources to achieve this.
- By identifying objectives and setting targets the company is committed to an economically viable, sustainable and continual improvement in our environmental, health, safety, energy and quality performance.
- The senior management has overall responsibility for the elimination or control of environmental, health, safety, energy and quality risk within the company. Directors, managers and supervisors have the responsibility to manage these activities accordingly as part of their duties.
- All employees at every level in the company are required by law to co-operate with the company and to take reasonable care in all matters connected to health and safety.
- The Company will consult with employees, and encourage participation, on matters affecting health and safety, this will include the facilitation of work's health and safety representatives.
- The company shall provide the necessary mechanisms and resources to identify and control the company's environmental & Energy impact so as to protect the environment reduce energy consumption and to prevent pollution. In the context of the company:
  - How the company uses raw materials and natural resources;
  - How the company uses energy;
  - Emissions to air from buildings and process vents;
  - Waste & Energy management, minimization and reuse and by using best available techniques;
  - Ensuring all staff are trained in energy awareness and energy saving, including at home;
- The Company will identify the risks to health and safety from its operations, not only to its employees but to others who can be affected by its operations, goods and services. These risks will be eliminated or reduced and / or managed as far as is reasonably practicable through:-
  - The identification and implementation of appropriate systems of work;
  - The provision and maintenance of appropriate plant;
  - The organization of the workplace including means of access and egress;
  - The provision of facilities and arrangements for welfare at work;
  - Ensuring the company actively manages heating, cooling, air-conditioning, ventilation and lighting, so as to avoid waste;
- It is recognized that a vital part in achieving the aims of this policy is the provision of information, instruction, training and supervision to employees and, as applicable, to other persons.
- This policy and the company's Environmental, Health, Safety, Energy and Quality performance is reviewed annually at management review. The results of audits and performance measurement feedback will guide this review and aid the planning of improvement targets.
- This policy shall be displayed on the company's applicable noticeboard, available on the company's intranet and be provided to any interested party on request.

Bernard Goodwin
Managing Director
Goodwin Steel Castings

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