

Capability



Combined Heat and Power



CHP

Fingleton White is Ireland's Leading Designer and Developer of Industrial CHP

Fingleton White was set up in 1981 to service the energy sector in Ireland. Since then it has been involved in many significant projects in the development of power generation, oil and natural gas infrastructure. It is the leading company of Engineers and Project Managers in the energy sector and holds a number of patented designs. Since its inception Fingleton White has completed projects with a capital value exceeding half a billion Euros.

Fingleton White has successfully completed a 16,000 MW gas station, 450 km of gas pipelines, 30 km of fibre network, 15 hydroelectric stations, 70 MW CHP facilities, waste to energy projects, numerous industrial refrigeration systems and boiler house upgrades. Our R&D and feasibility studies in the use of innovative technologies in the energy sector includes aviation fuel pipeline, district heating, domestic CHP, the use of compressed natural gas as a virtual pipeline and as a future fuel for vehicles.

Gatepower Supplying Steam and Electricity to St. James Gate since 1997.



In 1997, when the coal fired power station at St. James Gate Brewery was coming to the end of its useful life, Fingleton White provided a turnkey Build, Own, Operate solution to Guinness Ireland. The plant is still in operation today and the three SOLAR Taurus 60 gas turbines, rated at 4.8 MW each, have been meeting the electricity and steam requirements of the brewery with 97% availability. Now with a total of over 320,000 fired hours, the turbines have been fastidiously maintained. All three engines have been rebuilt with new gas generators and upgraded with the latest low NOx high efficiency technology as part of their long term maintenance cycle, ensuring that the plant performs to a higher standard now than when it was first installed.

As a measure of the success of this partnership, the contract has been extended for a further 10 years. A multi million euro upgrade project is being delivered to ensure the same performance and reliability is delivered to the St. James Gate site well into the 21st century.



Concept to Completion

Fingleton White provides the complete range of Engineering Services from conceptual design through to final commissioning

Services Fingleton White Provide

Fingleton White provide a full range of services to the industrial CHP sector. These can start with technical and commercial feasibility studies through to EPC and turnkey construction to Build, Own, Operate, Maintain or shared ownership.

- *Feasibility Studies*
- *Outline Design*
- *Commercial close Planning*
- *Planning, Regulatory & Environmental*
- *Connections and Off take Agreements*
- *Detailed Engineering*
- *Procurement*

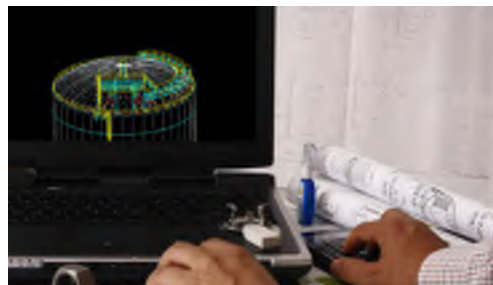


Feasibility Studies.

With a Stage 1 study, Fingleton White can assess the commercial and technical viability of CHP for your site using your energy consumption data and a tour of your site. Stage 2 involves the preparation of a budget cost estimate and a ROI model.

Outline Design

Once project viability is established, Fingleton White proceed to an outline design which locks down the choice of prime mover, running regime, potential fuel and off take contracts as well as plant footprint and stack heights etc. This is used as the basis for a commercial cost estimate.



Commercial Close

For a viable CHP project, we will set out a range of commercial options, from EPC and Turnkey construction to shared ownership or a BOOM contract.



Planning, Regulatory & Environmental

In addition to the preparation of all the necessary planning, and regulatory documents, where necessary Fingleton White prepare a full Environmental Impact Statement and apply for the appropriate emissions permits



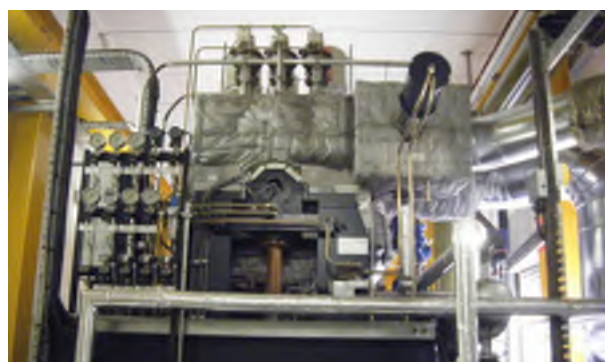
Connections and Offtake Agreements

The Fingleton White CHP head office support team are experienced in the sizing and negotiation of gas and electrical connection agreements to achieve the optimum connection size for the connected assets. (e.g. Autoproducer status).

With our experience of the wholesale energy markets Fingleton White help our clients negotiate gas purchase and electricity offtake agreements that are best suited to the plant and to their procurement strategy.

Detailed Engineering

Fingleton White's experienced design team performs all civil, mechanical, piping, electrical and automation design with a view to seamless integration of the CHP installation into the host site and with minimum disruption to ongoing operations of the site.



Procurement

Fingleton White liaise and negotiate with the vendors of the main capital equipment (prime mover and boiler) on the client's behalf and we oversee all factory acceptance testing.



CHP

Continuous Innovation drives Fingleton White engineering success.

Fingleton White strive to improve our designs by pioneering new technologies to give our clients a safer, greener, more reliable, and more efficient plant.

Greener

Our more efficient designs extract more energy from the fuel. The use of variable speed drives on cooling fans reduces parasitic site load. Our boiler feed water treatment systems are carefully designed to minimise the consumption of water treatment chemicals.



More Reliable

Our control system design principles are based on "engineering for reliability". Our engine and boiler controls are designed to incorporate redundant critical sensors to ensure that the failure of any one instrument will not cause the plant to shut down.

More Efficient

Fingleton White specify only the highest efficiency in the prime mover and ancillaries because every 1% increase in plant efficiency can lead to an additional 10+% in profitability.



| Revenue, Costs and Margins | | | | | |
|----------------------------|--------|--------|--------|--------|-------------------|
| £/hr | Unit 1 | Unit 2 | Unit 3 | Unit 4 | Site Report Plant |
| Electricity | 0 | 806 | 858 | 0 | 1664 |
| Steam Production | 0 | 392 | 359 | 0 | 751 |
| Gas Consumption | 0 | 569 | 571 | 0 | 1140 |
| Import | | | | | 0 |
| Gross Margin | 0 | 288 | 268 | 1 | 557 |

| Electricity, Steam and Gas Rates | | | | | |
|----------------------------------|---------|---------|---------|------|--|
| Salvage Day Rate | 0.18345 | £/hr | Change | | |
| Export Day Rate | 0.09008 | £/hr | Change | | |
| Import Day Cost | 0.15118 | £/hr | Change | | |
| Salvage Night Rate | 0.07108 | £/hr | Change | | |
| Export Night Rate | 0.04788 | £/hr | Change | | |
| Import Night Cost | 0.06000 | £/hr | Change | | |
| Elec Rates New | 0.10207 | 0.09008 | 0.11111 | £/hr | |
| Steam Rate | 0.00990 | £/hr | Change | | |
| Gas Cost | 0.03080 | £/hr | Change | | |

More Profitable

Our Control systems incorporate real time profitability monitoring and the in-built algorithms calculate the marginal cost of operation to optimise profits



CHP

CHP Projects

| Name | Location | Description | Commissioned | Hours Operating 2023 |
|--------------------------|----------------------------------|---|---|----------------------|
| C.H.P. Ltd. | Dairygold, Mallow | 4.0MW Gas Turbine 20 tonne/hr Boiler | Mar 1993 | 196,652 hrs |
| CoGen Ltd. Unit 1 | Dairygold, Mitchelstown | 4.8MW Gas Turbine 23 tonne/hr Boiler | Feb 1997 | 182,455 hrs |
| CoGen Ltd. Unit 2 | Dairygold, Mitchelstown | 5.0MW Gas Turbine 27 tonne/hr Boiler | Nov 1999 | 167,802 hrs |
| Gatepower Ltd. Unit 1 | Diageo - Guinness | 4.8MW Gas Turbine 27 tonne/hr Boiler | Oct 1997 | 209,928 hrs |
| Gatepower Ltd. Unit 2 | Diageo - Guinness | 4.8MW Gas Turbine 27 tonne/hr Boiler | Dec 1997 | 130,306 hrs |
| Gatepower Ltd. Unit 3 | Diageo - Guinness | 4.8MW Gas Turbine 27 tonne/hr Boiler | Jan 1998 | 133,775 hrs |
| GV Power Ltd. | Kerry, Charleville | 5.0MW Gas Turbine 27 tonne/hr Boiler | Nov 1999 | 176,088 hrs |
| Askeaton Power | Nestlé, Askeaton | 5.0MW Gas Turbine 30 tonne/hr Boiler | Nov 2004 | 154,915 hrs |
| C.M.P. Ltd. | Carbery Milk Products, Ballineen | 5.0MW Gas Turbine 30 tonne/hr Boiler | Fingletton White Operating since May 2006 | 170,527 hrs |
| Ballyragget Power Unit 1 | Tirlan, Ballyragget | 4.8MW Gas Turbine 27 tonne/hr Boiler | Fingletton White Operating since Sept 2007 | 171,542 hrs |
| Ballyragget Power Unit 2 | Tirlan, Ballyragget | 4.8MW Gas Turbine 27 tonne/hr Boiler | Fingletton White Operating since Sept 2007 | 170,866 hrs |
| Munster Joinery | Munster Joinery, Ballydesmond | 3.0MW Steam Turbine 15 tonne/hr Boiler | Jan 2009 | 108,030 hrs |
| Pfizer | Pfizer Grangecastle | 5.0MW Gas Turbine 24 tonne/hr Boiler | Oct 2009 | 118,664 hrs |
| Baillieboro Unit 1 | Lakeland Diaries, Baillieboro | 5.0MW Gas Turbine 28 tonne/hr Boiler | Dec 2009 | 116,886 hrs |
| Baillieboro Unit 2 | Lakeland Diaries, Baillieboro | 5.0MW Gas Turbine 28 tonne/hr Boiler | Feb 2016 | 65,262 hrs |
| | | | Total | 2,273,698 hrs |



Judged Winner Large CHP System 2002 by Sustainable Energy Ireland

The installation consists of a 5.0 MW gas turbine and a 0.5 km high pressure gas line and 10 kV power supply with all necessary protection equipment commissioned in 1999.



The CHP plant is housed in a purpose built building on the site.

The CHP system incorporates a Centrax / Rolls Royce KB7S Gas Turbine and 27 tonnes/hr steam boiler operating at 13 bar. GV Power Ltd provides over 95% of the dairy plant's steam and electricity requirements while guaranteeing energy cost savings and reliability to the host site.

The system incorporates state of the art control technology and automation software. A site specifically designed SCADA system logs and monitors an extensive range of plant parameters with pager based callout for early alarm notification.



Kerry Group Charleville



Scope

Design, construction and operation of 5.0MW Gas Fired Combined Head and Power Station.

Client

Kerry Group

Commissioned

1999

Services Provided

- Conceptual Design
- Mechanical Design
- Electrical and C&I Design
- Civil Design
- Turbine Selection
- Boiler Selection
- Project Management
- Construction Supervision
- Operating of Facility



Guaranteed cost savings with on-site steam & electricity delivery.

The CHP plant is housed in a purpose built building adjacent to the existing boiler house on site.

The facility consists of one 5 MW CENTRAX KB7 gas turbine generating set along with one 28 tonnes/hr supplementary fired waste heat boiler operating at 17.2 Bar.



The system is designed to operate on natural gas fuel.

The CHP facility supplies the majority of the site steam and electricity requirements while guaranteeing energy cost savings and reliability to the host site.

The system incorporates state of the art control technology and automation software.

A site specific SCADA system monitors an extensive range of plant parameters with SMS text alerts for alarm notification.



Lakeland Baileboro No 1



Scope

Design, procurement and installation of 5.0MW gas turbine and 28t/hr boiler, control equipment and associated works.

Client

Lakeland Diaries

Commissioned

2009

Services Provided

- Boiler Selection
- Conceptual Design
- Project Management
- Mechanical Design
- Construction Supervision
- Electrical and C&I Design
- Health & Safety Plan
- Civil Design
- Commissioning Facility
- Turbine Selection
- Operation of Facility
- Boiler Selection



Second CHP Plant installed to meet Lakeland Dairies Plant Expansion Demands.

The second CHP plant is housed adjacent to the existing CHP unit.

This CHP consists of one 5 MW CENTRAX KB7 gas turbine generating set along with one 28 tonnes/hr supplementary fired waste heat boiler operating at 17.2 Bar.



The CHP is designed to operate on natural gas fuel and in parallel with the existing CHP unit.

The overall CHP facility supplies the majority of the site steam and electricity requirements while guaranteeing energy cost savings and reliability to the host site.

The system incorporates state of the art control technology and automation software.

A site specific SCADA system monitors an extensive range of plant parameters with SMS text alerts for alarm notification.



Lakeland Baileboro No 2



Scope

Design, build and operate 2nd CHP.

Client

Lakeland Dairies

Commissioned

2016

Services Provided

- Conceptual Design
- Project Management
- Mechanical Design
- Construction Supervision
- Electrical and C&I Design
- Health & Safety Plan
- Civil Design
- Commissioning Facility
- Turbine Selection
- Operation of Facility
- Boiler Selection



CHP Installation provides 100% of Electricity for Brewery at St James's Gate

In November 1997, Gatepower Ltd. commenced commercial operation of a 14.4 MW gas fired CHP station located at the Guinness Brewery, St. James' Gate, Dublin.



The CHP plant is situated outdoors within the brewery site, and incorporates three SOLAR Taurus 60 gas turbines, rated at 4.8 MW each, along with three 27 tonnes/hr steam boilers.

The system is built to operate on either natural gas or diesel fuel, and also includes a standby 27 t/hr boiler and a blackstart generator. In 2003, the plant completed a major 5-year overhaul works, during which the gas turbines were replaced with the more advanced model 7301 of the Taurus 60 gas turbine.



Gatepower provides 100% of the Guinness electricity and steam demands, and exports approximately 40% of generated electricity to the national grid. The system is designed to maintain electricity and steam supplies to the site 365 days per year, and can ride through electrical grid outages and any gas fuel supply interruptions.



The Gatepower control and automation systems are designed to facilitate a 'black start' operation, with the SCADA monitoring system linked to a SMS text notification callout alarm system. The system notification will alert an operator to various plant alarm conditions, with a radio system backup in the event of telecoms system failure.

Gatepower was judged winner of Boilerhouse CHP System of the Year in 1999 and 2001, and runner-up in 2000.

Guinness, Dublin

DIAGEO

Scope

Design, construction and operation of 14.2MW Gas Fired Combined Heat and Power Station, Including:

- 3 X 4.8 MW gas turbines
- 3 X 27t/h Waste Heat Boilers
- 1 No 27t/h Independent Fired Boiler

Client

Diageo

Commissioned

1997

Services Provided

- Conceptual Design
- Project Management
- Mechanical Design
- Construction Supervision
- Electrical and C&I
- Civil Design Commissioning
- Facility Turbine Selection
- Operation of Facility
- Boiler Selection

Fingleton White install wood burning CHP Facility for Munster Joinery

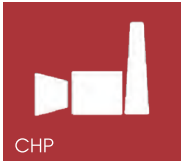
The CHP consists of a wood burning furnace, water tube boiler and steam turbine. The process involves burning the wood chips and sawdust to produce a high temperature exhaust, which in turn is passed through the waste heat boiler to produce steam.



The steam has two purposes;

1. Heating for timber drying and space heating.
2. Electrical Generation.

The building housing the CHP facility is constructed from a structural steel portal framework with external walls of insulated twin skinned steel panels. It is a 27m long x 19m high x 9m wide Boiler House to house the Boiler and ancillary mechanical plant.



The project was constructed over 2 phases.

Phase I - 12,0 MW boiler, operating in hot water mode and associated heating system.

Phase II - Retrofitting of the boiler to operate in steam mode and installation of a 3.0 MW steam turbine electrical generator and ancillary systems.



Munster Joinery CHP Facility



Scope

Design and construction of a 3.0MW sawdust and wood chip fueled Combined Heat and Power facility consists of 1 no 12.0MW (15t/hr) boiler and 1 no 3.0MW steam turbine.

Client

Munster Joinery Ltd.

Commissioned

Phase I 2005.
Phase II 2008.

Services Provided

Feasibility Study
Conceptual Design
Boiler Selection Turbine Selection
Mechanical Design
Civil Design
Electrical and C&I Design
Project Management
Construction Supervision



Nestle manufacturing plant powered by 5 MW gas powered CHP Facility

In November 2004 Askeaton Power Ltd. commenced commercial operation of the 5 MW Gas Fired CHP facility located at the Nestle (formerly Wyeth) Nutritionals manufacturing plant at Askeaton, Co. Limerick.



The CHP facility is situated within an architecturally designed building complimenting existing site buildings.

The facility consists of one Centrax packaged 5 MW Rolls Royce KB7S Generating Set along with one 30 tonnes/hr supplementary fired waste heat boiler. The system is designed to operate on either natural gas or diesel fuel.



The CHP facility supplies the majority of the site steam and electricity requirements while guaranteeing energy cost savings and reliability to the host site. As part of the project Askeaton Power Ltd. converted the



existing site boilers from HFO to natural gas firing. Askeaton Power Ltd. integrated the existing boilerhouse with the CHP facility.

The system incorporates state of the art control technology and automation software. A site specific SCADA system monitors an extensive range of plant parameters with SMS text alert for alarm notification.



Nestle Askeaton



Nestle

Good Food, Good Life

Scope

Design, procurement and installation of 5.0MW gas turbine and 30t/hr boiler, control equipment and associated works.

Conversion of existing boilerhouse to natural gas and automation of existing boilerhouse.

Client

Wyeth Nutritionals

Commissioned

2004

Services Provided

- Arrangement of Finance
- Boiler Selection
- Conceptual Design
- Project Management
- Mechanical Design
- Construction Supervision
- Electrical and C&I Design
- Health & Safety Plan
- Civil Design
- Commissioning Facility
- Turbine Selection
- Operation of Facility



Project to improve plant performance and reliability

Chilton Biomass CHP has a electrical installed capacity of 17.45 MWe and is operating as Waste Incinerator Directive plant, firing waste wood at a rate of 12 t/h to 15t/h. The heat load for the CHP is a pellet mill with a capacity of 8 t/h. The boiler is a Kablitz water tube boiler with a capacity of 67.2 t/h of superheated steam at 86 Bara at 495°C. The turbine is a Man Turbo steam turbine with 3 steam bleeds, which are used for feed water heating and to supply heat to the pellet mill.

Fingleton White were contracted to improve boiler performance and reliability. Following an indepth review of the plant, Fingleton White submitted a proposal with a number of recommedations that would achieve an overall availability of 90%.



The areas of focus were

- Fuel control through written quality procedures, fuel handling methods and enforcement of quality procedures
- Combsution control
- Soot blowers.
- Dust Emmissions reduced by the installation of additional filters on the pellet mill.



Biomass Plant Chilton UK



Scope

Improve performance and reliability.

Client

Dalkia Bio Energy

Commissioned

On-going

Services Provided

Feasibility Study
Conceptual Design
Electrical and C&I Design
Project Management
Construction Supervision

Achieved significant cost savings since the installation 4.2 MW CHP

The installation consists of a 4.2 MW gas turbine and 1 20t/hr boiler. The project also involved the design and construction of a 0.5km, 19 bar gas line and pressure reduction facility as well as a 10kv power supply with all the necessary protection equipment.



The CHP plant was built as an integrated facility in the existing boilerhouse.

The CHP system incorporates a Centrax / Rolls Royce KB5S Gas Turbine rated at 4.2 MWe and a steam boiler rated at 20 tonnes/hr operating at 13.5 barG. CHP Ltd provides over 90% of the dairy plant steam and power requirements, at Mallow, while guaranteeing energy cost savings and reliability to the site.



Dairygold achieved significant cost savings since the installation in 1993 and since then has installed a further 2.5 MW CHP stations at its Mitchelstown milk processing plant in conjunction with Fingleton White.



Dairygold Mallow



Scope

Design, construction and operation of 4.2MW Gas Fired Combined Head and Power Station.

Client

Dairygold

Commissioned

1993

Services Provided

- Conceptual Design
- Mechanical Design
- Electrical and C&I Design
- Civil Design
- Turbine Selection
- Boiler Selection
- Project Management
- Construction Supervision
- Operating of Facility



The system incorporates state of the art control technology

The installation consists of a 4.8 MW gas turbine and 1 23 t/hr boiler commissioned in 1997 and a 5.2 MW gas turbine and 27 t/hr boiler commissioned in 1999. The project also involved the design and construction of a 1 km, 19 bar gasline and pressure reduction facility as well as a 10 kV power supply with all the necessary protection equipment.



The CHP plant is housed in a purpose built building on the site.

The CHP system incorporates 2 Centrax / Rolls Royce KB7S Gas Turbines rated at 5.2 MWe and associated steam boilers rated at 23 tonnes/hr and 27 tonnes/hr respectively operating at 17 bar. Cogen Ltd provides over 85% of power requirements while guaranteeing energy cost savings and reliability to the host site.



The system incorporates state of the art control technology and automation software. It was also judged Winner Large CHP System for 2000 and runner-up in 2001 by Sustainable Energy Ireland.



Dairygold Mitchelstown



Scope

Design, construction and operation of 10MW Gas Fired Combined Heat and Power Station.

Client

Dairygold

Commissioned

Phase 1 1997
Phase 2 1999

Services Provided

- Conceptual Design
- Mechanical Design
- Electrical and C&I Design
- Civil Design
- Turbine Selection
- Boiler Selection
- Project Management
- Construction Supervision
- Operating of Facility



CHP installation delivers energy requirements and guaranteed cost savings

The CHP facility is situated within an architecturally designed building complementing the existing site buildings.



The facility consists of one 5 MW SOLAR Taurus 60 gas turbine generating set along with one 24 tonnes/hr supplementary fired waste heat boiler operating at 13 Bar.

The system is designed to operate on natural gas fuel.

The CHP facility supplies the majority of the site steam and electricity requirements while guaranteeing energy cost savings and reliability to the host site.



The system incorporates state of the art control technology and automation software.



A site specific SCADA system monitors an extensive range of plant parameters with pager based callout for alarm notification.

System availability is in excess of 96%.



Pfizer Grangecastle



Scope

Design, procurement and installation of 5.0MW gas turbine and 24t/hr boiler, control equipment and associated works. The project also involves interfacing with the current boiler control system in Pfizer.

Client

Pfizer

Commissioned

2009

Services Provided

- Boiler Selection
- Conceptual Design
- Project Management
- Mechanical Design
- Construction Supervision
- Electrical and C&I Design
- Health & Safety Plan
- Civil Design
- Commissioning Facility
- Turbine Selection
- Operation of Facility



Balance of Plant design for Mayo Renewable Power 48 MW

Mayo Renewable Power planned to develop a 48 MW Biomass high efficiency CHP plant on the former Ashahi site, in Killala, Co. Mayo. The plant was designed to use 30 t/h of biomass to generate 48 MW of electrical power with heat recovered to a colocated low temperature drying process. Fingleton White were appointed to complete the design of the balance of plant for the facility complete.



The turbine design parameters were superheated steam at 114 bar 538 °C at a flowrate of 174 t/h. The balance of plant systems designed by Fingleton White included;



High Pressure Steam, Extraction Steam HP & LP, Condensate, Boiler Feedwater, Raw Water, Demineralised Water, Ammonia, Fuel Handling and Storage, Cooling Water, Auxiliary Cooling Water, Compressed Air, Service Water, Drains, Building Services and Dryers.

The design documentation for each of these balance of plant systems included design calculations, process flow diagrams, P&IDs, Battery Limits drawings, General arrangement drawings, piping specifications, equipment specifications, equipment lists, valve and control valve schedules and specifications, load lists and a 3D plant model of the complete site was developed.

FW worked closely with many stakeholders on the project including; the plant owner, the Owner's engineers, the main contractor, main equipment vendors, other equipment vendors, the commission for energy regulation, other consulting engineers and architects on the job which had an overall budget of €180 million and a programme of two years.



Biomass Plant Mayo, Ireland



Scope

Balance of Plant Design

Client

Sisk

Commissioned

Expected 2017

Services Provided

- Mechanical Equipment Specifications
- Piping Design
- Process Flow Diagrams
- Piping & Instrumentation Diagrams
- Electrical & Control Equipment Specifications
- Single Line Diagrams
- Electrical Detail Design
- Non Process M&E
- Support During Commissioning

