CASE STUDY

Munster Joinery

Introduction

Munster Joinery was established in Ballydesmond, Co. Cork in 1973 and is now Ireland's leading manufacturer of energy efficient windows and doors. The company supplies both the Irish and UK markets.

Project Background

Prior to the installation of the on-site wind energy project, Munster Joinery's primary energy source was the grid. The company's annual energy consumption was in the region of 26 GW hours. In 2006 Munster Joinery undertook a review of its energy costs. In the light of rising oil and gas prices and the likely introduction of carbon taxes, the company decided to examine means of **hedging their future energy costs** and simultaneously reducing their carbon emissions.

The key priorities that were considered were:

1. The need to reduce energy costs
2. To utilize an additional renewable energy source (Biomass CHP was already in planning stage)
3. To reduce carbon emissions

Together with Wind Energy Direct (WED) and Fingleton White & Co. Ltd. the company examined the option of wind energy and Biomass CHP autoproduction, i.e. installing wind turbines on-site primarily for on-site energy consumption.

The key benefits of installing wind energy and Biomass CHP on-site are:

- Independence from fossil fuel price inflation
- Significant financial savings as grid prices increase
- Wind energy is carbon neutral and generates large carbon savings
- Transform an existing waste stream into valuable electricity and heat

Wind Project Development

Wind Energy Direct undertook a feasibility study of the Ballydesmond site to assess:

- If there was sufficient space on site or close by to install turbines
- The proximity of nearby houses, roads, railways and airports

Following the feasibility study the following steps were undertaken:

- Wind Analysis – erecting a wind anemometer for 12 months to measure the speed and direction of the wind (at various heights)
- Applying for planning permission to Cork County Council
  Planning involved the following steps:
    - Geotechnical study
    - Environmental Impact Assessment
    - Noise study
    - Visual Impact and landscape study
    - Geology and hydrology study
    - Archaeological study
    - Electromagnetic study
    - Assessments of Cork and Kerry development plans
    - Ecology study, including assessments of impact on:
        - Special protected areas
        - Special areas of conservation
        - Birds and bats

Munster Joinery was very aware of the need to consult with the local community about this project. The company went door-to-door to talk to local residents and explain what the project would involve and the benefits it would yield to the company and to the wider community. The turbines will essentially result in energy cost and carbon savings for Munster Joinery, which translate into strengthening the sustainability of jobs locally.

"Changes in the electricity market in Ireland were imposing increases of 20% – 25% on our energy bills. The installation of these turbines gives us the opportunity to break the link with energy inflation, to reduce our carbon emissions and is consistent with our product marketing messages."

Sean Michael, Finance Manager, Munster Joinery

Installing the turbines

The timeframe for the planning and installation of the turbines is highlighted in the chart below:

Initiate and Planning - 2006	Mobilise/Foundations - November 2008	Install Turbines - February 09	Project Commissioning
Feasibility study	Mobilise T1 – 28/11/08	T1 tower delivery concrete section – 05/01/09	Pilot/Commissioning – 30/03/09
On-site wind analysis	T1 Excavate and blind 28/11/08	Assemble T1 concrete tower section – 01/02/09	T1 Commissioning – 02/04/09
Geotechnical survey	T1 Shutter and fill – 02/12/08	T1 turbine/blade delivery	T2 Commissioning – 02/04/09
EIS completed	T1 **Final inspection** – 03/12/08	T1 - tower delivery – 10/03/09	Commissioning and optimisation by WED – 04/09
Planning permission granted	T2 Excavate and blind – 04/12/08	T1 - install tower/blades – 13/03/09	
Application for grid connection	T2 Shutter and fill – 05/12/08	T2 – tower delivery concrete section – 09/01/09	
Power purchase agreement	T2 **Final inspection** -17/12/08	Assemble T2 concrete tower section – 20/02/09	
	Accommodation works – 13/12/08	T2 turbine/blade delivery – 24/03/09	
	Hardstand areas T1 and T2 commenced – 20/12/08	T2 install tower/blades – 29/03/09	

Erection of the turbines

The construction of the turbines commenced in late November 2008, beginning with the excavation of the turbine foundations, followed by the manufacture and erection of concrete towers. The Munster Joinery project is unique in having two concrete towers up to 60 meters with steel making up the remaining height. These concrete versions of the turbine tower were chosen to mitigate wind turbulence in the area. The two turbines were installed by the end of March and commissioned in May 2009.

The turbines at Munster Joinery are Enercon E82 models and are 2 MW each. The towers are 85 meters in height to the nacelle or hub. Enercon turbines are unique in not having a gearbox. The nacelle can swing 360° degrees and each blade has an independent pitch motor.

Operation of Turbines

Since the turbines were commissioned, 73% of the generated electricity has been consumed on-site. The balance has been exported to the grid. In the past 10 months the turbines have provided the factory with 34% of their energy needs – displacing mostly fossil fuel sourced grid electricity.

Over a five year period the savings for Munster Joinery will be approximately €1,000,000. Another very important saving for Munster Joinery is the reduction in carbon emissions. Each megawatt of installed wind will save 1,550 tonnes of carbon dioxide (based on average carbon intensity of grid sourced electricity).

The Sustainable Energy Authority of Ireland (SEAI) recognized the importance of this project as a demonstrator of large scale wind autoproduction in Ireland and supported this project with a grant of €1m.

Project Economics

Total Project Cost	€6,116, 000
SEAI Grant	€1,005,763
Annual Savings for Munster Joinery	Approximately €150,000*

*depending on the price of fossil fuels

Environmental Impact

Having a strong environmental focus is very important to Munster Joinery. The objective of lowering the company's carbon footprint is aligned to their marketing message of producing energy efficient windows and doors.

Fig 1 – Controlled extraction turbine

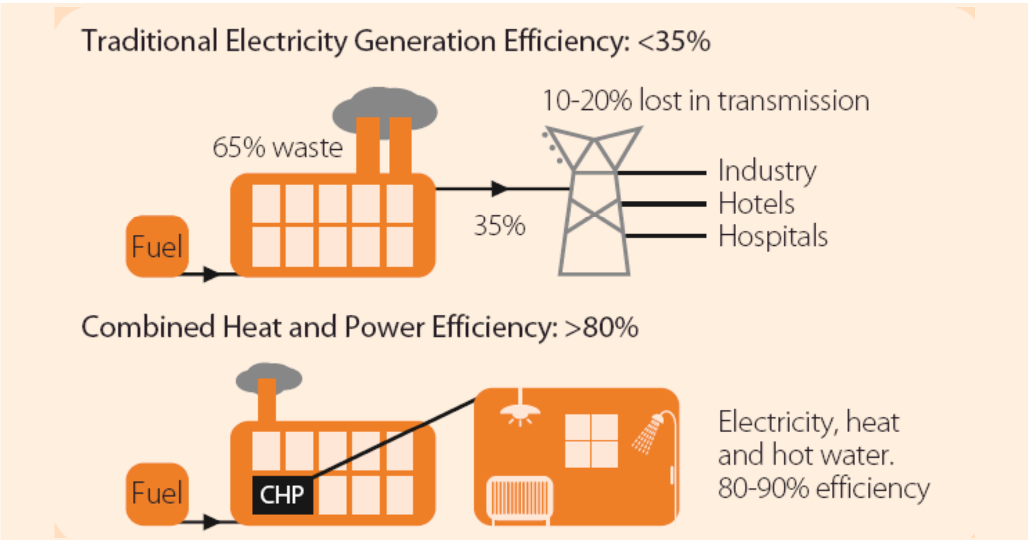
Fig 2 – Boiler house

Fig 3 – Boiler under construction

Why Biomass CHP?

Biomass Combined Heat and Power (CHP) is a very common industrial energy efficient technology used increasingly in industry world-wide. CHP is the generation of thermal and electrical energy in a single process. CHP installations can typically convert up to 90% of the energy in the fuel into electrical power and useful heat. This compares with conventional power generation, which has a delivered energy efficiency of only around 40%. Biomass CHP uses a renewable source of energy, which is carbon dioxide neutral. CHP technology can be used to produce process or space heating and hot water for commercial and industrial applications. For energy intensive industries, CHP can make a significant impact on profitability.

For large energy users participating in the Emissions Trading Scheme adopting biomass CHP facilitates increased production and trade in carbon credits.



Key Benefits to the Biomass CHP Owner:

- Biomass CHP can reduce energy costs
- Biomass CHP enhances competitiveness as it is a highly efficient energy technology widely used by industry in Europe and elsewhere
- Biomass CHP can offer security against energy price fluctuations
- Biomass CHP provides a secure supply of energy for industry
- Biomass CHP can help your business comply with environmental legislation. It also reduces exposure to Emissions Trading Scheme limits as biomass is carbon neutral.

The plant is designed to:

- Provide all the site heat requirements and use the produced electricity on site (autoproduction)
- Receive, store and transfer the fuel from the conveyor to the combustor and burn the fuel in an efficient manner to raise steam
- Discharge the combustion products in an environmentally acceptable manner
- Convert energy in the steam to electrical energy in the turbine/generator
- Operate 24 hours a day continuously throughout the year.

Key Benefits of the project

For the end user:

- Generate useful energy in the form of heat and electricity from a process by-product that prior to the project was a net consumer of energy to dispose of, in the form of dissipater fans.
- Provide all the site heat requirements and use the produced electricity on site (autoproduction).
- Provide all of the sites heat requirements from a renewable source, reducing the carbon intensity of joinery operations.
- Reduce fossil fuel imports for heating purposes on the site to zero as all heat is now supplied from a single high efficiency biomass CHP.
- Improves the competitiveness of the joinery, through lower energy costs.

For Ireland:

- Reduces our reliance on fossil fuels.
- Reduces our carbon emissions and contributes to our commitments under The Kyoto protocol.
- Improves competitiveness.
- Greater mix in our energy supply and increases our energy security.
- Stimulates local employment.


Fig 4 – Boiler house


Fig 5 – Pipe bridge


Fig 6 – Condenser

Overview of the Biomass CHP Plant Operation

The CHP facility was developed by Fingleton White & Co. Ltd.. It is designed to burn wood chip and saw dust, up to a maximum of 2 t/h sawdust and 2 t/h of wood chip. Two separate feed systems are used; sawdust is combusted in suspension, blown in from the sides of the furnace, while wood chip is delivered directly to the air cooled reciprocating grate, where combustion takes place.

The joinery is fitted with dust extraction units that transport sawdust from the individual saws in the joinery to two fuel storage bunkers with moving floors. Off cuts from the joinery are brought by forklift to the chipping area, where they are chipped and transported via a combination of conveyors and augers to a chip storage bunker. Each of the three fuel storage bunkers have a capacity for 700m^3 of fuel. This is enough storage to run the plant for 15 days.

The boiler is supplied by Lambion and is a reciprocating grate, single pass shell and tube type, with refractory lined wet walls and two stages of super heaters. An induced draught fan maintains a negative pressure in the furnace, while combustion air is delivered by primary and secondary air fans, designed to ensure good quality combustion, ensuring full and efficient burnout of woodchip and sawdust.

The boiler produces 15 t/h of steam at 400°C and 25 barG, which is supplied to the condensing steam turbine with controlled extraction. The flow rate of steam to the turbine is controlled based on boiler pressure. Three hydraulic control valves modulate to maintain the boiler pressure at 25 barG. The steam is expanded across the first three stages of the turbine generating power in the turbine shaft which is converted to electrical power in the generator. Steam is extracted from the turbine to provide heat to the kilns, paint machines and space heating as required. Any extra heat is passed through the remaining five turbine stages generating electrical power.

Bottom ash is removed from the grate by the reciprocating action of the grate; bottom ash drops into an auger and this removes the ash to an external bin. The flue gases are released via a 40m stack after the cleaning process (cyclone and electro static precipitator).

Project includes:

- Fuel storage shed
- Fuel delivery system
- Boiler house and boiler house services
- Reciprocating grate biomass boiler
- High pressure steam pipework
- Condensing steam turbine with controlled extraction
- Condenser
- Cooling tower and cooling water pipework
- Cyclone and electro static precipitator flue gas treatment
- Water treatment plant
- Ash removal system
- Grid connection
- IPC license

The Sustainable Energy Authority of Ireland (SEAI) recognized the importance of this project as a demonstration of Biomass CHP autoproduction in Ireland and supported this project with a grant of €1.38m.

Munster Joinery Biomass CHP Case Study
Location:
Lackacross, Ballydesmond, Cork
Project start date:
May 2005
Commission date:
October 2008
Owner:
Munster Joinery
Project capital costs:
€10m
Engineering, design and project management:
Fingleton White & Co. Ltd.

Technical details:
13.8 MW fuel input
12 MW steam capacity
3 MW maximum electrical output or 24.6 GWh/yr
9 MW maximum thermal output or 73.8 GWh/yr

Environmental Impact:
22,250 t CO_2 savings per year

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EUROPEAN REGIONAL DEVELOPMENT FUND

Ireland's EU Structural Funds Programmes 2007 - 2013
Co-funded by the Irish Government and the European Union

The Sustainable Energy Authority of Ireland is financed by Ireland's EU Structural Funds Programme co-funded by the Irish Government and the European Union