



CASE STUDY
15939

Plastic Omnium

Edison Road CHP 400V Connection



Plastic Omnium Edison Road CHP

Powersystems high voltage (HV) power engineering was responsible for the design, installation, testing and commissioning of the electrical infrastructure associated with the construction of the 1.3 MW Combined Heat and Power (CHP) generator connection at Plastic Omnium, Edison Road, Hams Hall, Birmingham.

The plant was designed to provide the factory with a more economical alternative supply of electricity, hot water and steam to supplement the systems already in place. The principle of the development and its impact on environmental, social and economic factors was carefully assessed and given the go-ahead.

Plastic Omnium Edison Road CHP plant is a 1.3 MW generation platform that will begin to supply power to the factory in January 2021. The site consists of one 1.3 MW generator powered by an MTU 12V4000 GS engine supplied by 2G Ltd, which is capable of supplying electricity continuously to the factory in parallel to the grid. As a trusted NERS accredited company with over 40 years' experience, Powersystems were appointed to assume the responsibility for the installation of electrical infrastructure.

Project Facts and Figures:

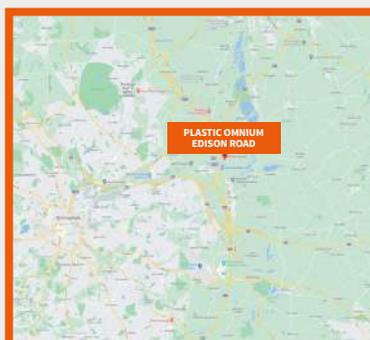
- ▶ Number of generators: 1
- ▶ Generator capacity: 1.3 MW
- ▶ Total Installed capacity: 1.3 MW
- ▶ Connection Voltage: 0.400 kV
- ▶ Altitudes of site: 264 ft
- ▶ Length of onsite 400 V cabling: 1.2 km
- ▶ Length of onsite control & signal cabling: 0.25 km
- ▶ Cable containment ladder systems installation 160 m
- ▶ Powersystems are a Lloyds registered (NERS) approved independent connection provider (ICP)

Powersystems partnerships



The site is located in Edison Rd, Hams Hall, Birmingham and was constructed in partnership with B.T.O'Sullivan Construction Solutions Ltd and 2G Ltd on behalf of the client, BasePower.

The site connects onto the Plastic Omnium Edison Rd 400V network which is supplied by the factory's private 11 kV network and is a part of Western Powers (WPD) larger electricity network. Powersystems have connected countless CHP generator projects to the grid over the years, this project being number three of four this year for our client BasePower, which exemplifies our strong and trusting relationship. Our engineers have the much-needed experience of working with every Distribution Network Operator (DNO) across the UK on this type of project, helping customers connect this type of project up and down the country.





CHP development

As UK energy production is changing fast and becoming more expensive, manufacturers who consume large amounts of energy need to find new ways to reduce cost and remain competitive.

Plastic Omnium Edison Rd CHP will allow our client Basepower to provide the factory with on-site energy generation at a reduced cost when compared to more conventional sources. This not only helps the manufacturer reduce cost, it also addresses the Governments strategy for a low carbon economy.

CHP technology works by utilising a fuel source to generate electricity, this project utilised a typically used fuel source in natural gas. The electricity produced by the CHP will be utilised by the factory to match the current load consumption at a reduced rate.

The CHP engine will also harness the waste heat produced by the process of generating electricity, this heat will distribute hot water and steam through heating pipework to provide heating and hot water to the factory buildings.

By being able to generate electricity and heat through one fuel source simultaneously, the CHP becomes much more efficient than traditional power generation due to the reduction in wasted energy and has been known to improve energy efficiency by up to 45%.

Scope of works and major design considerations

The major items of electrical Infrastructure that Powersystems designed, supplied, installed, and commissioned were for the design, supply, installation, testing and commissioning of the 11/0.4 kV grid connection consisting of:

- ▶ Installation of HV CT's to the site incomer cable box including SAP attendance and a controlled site shutdown
- ▶ Installation of a Schneider MTZ2 2500A AIB for the connection of the 1.3 MW CHP, including alteration works of the clients existing LV switchboard
- ▶ Design and installation of the cable containment systems
- ▶ 0.400 kV cable installation including termination of cables at the clients LV switchboard and 2G's G99 circuit breaker (Schneider Masterpact CB)
- ▶ Installation of an Argand system, to provide site import/export signals to the BMS to enable control of the generator output
- ▶ 0.400 kV auxiliary supply connections to the pump kiosk LV distribution board
- ▶ Programming of protection for the associated circuit breakers
- ▶ Earthing design and installation
- ▶ Within the CHP site, the installation of low voltage, control, signal and communications cabling works
- ▶ Carry out full fault level and protection studies for all new equipment.



Plastic Omnium

Plastic Omnium Edison Road Project timings

Construction of The Plastic Omnium Edison Road CHP generator initially began in September 2020. Unfortunately, this was during a critical stage of the UK lock down due to the Coronavirus pandemic but, despite the necessary restrictions and with the right health and safety approach and procedures implemented, the project continued at a steady and efficient pace. Powersystems mobilised on site in September 2020 which involved preparing the ground for construction activity. Plant and material deliveries such as tower scaffolding, cherry pickers and ladder system components commenced, with key dates such as Energisation and G99 Testing on 1st December 2020 and 18th January 2021 respectively.

What the client wanted

As UK energy production is changing fast and becoming more expensive, manufacturers who consume large amounts of energy need to find new ways to reduce cost and remain competitive.

BasePower offer a solution to manufacturers via their award-winning business model, that would see manufacturers develop and operate on-site energy generation schemes. This not only helps the manufacturer reduce cost, it also addresses the Governments strategy for a low carbon economy. Powersystems being an Independent Connection Provider (ICP) would be charged with becoming a conduit for the grid connection to allow these types of schemes become reality.



Design works

Design work is a vitally import part of any Powersystems project, at this stage we ensure the project will meet the clients regulatory, economic and, most importantly, safety requirements. The design works included in this project are listed below;

- ▶ Design of the measurement HV CT's installation
- ▶ Design of the LV cable containment system
- ▶ LV earthing design – this included the general arrangements and conductor calculations for cable sizing adequate enough to carry the relevant fault currents in the event of an earth fault
- ▶ LV cable calculations and cable sizing appropriate to the project loads
- ▶ LV cable route design, including full site layout highlighting the fully ducted route from the existing network to the CHP
- ▶ Fault calculations & protection study for all new equipment. All the new equipment required protection co-ordination to achieve correct and effective grading and this was achieved through the protection study. This included producing a protection single line diagram (SLD) and the study of the protection relay curves using Amtech Protect software and CAD
- ▶ Full fault level study to determine if the clients existing network is capable of accommodating the addition of the 1.3 MW CHP
- ▶ Control & signal cable - this included the design of all small power and equipment control wiring.



How Powersystems have helped

Powersystems were appointed as the CHP project HV/LV electrical contractor, involved with the design, installation and commissioning of the electrical infrastructure for the CHP project. Powersystems aim was to provide a high-quality service throughout this project, Powersystems achieved this by setting out objectives such as ensuring technical correctness, ensuring the client was getting exactly what they asked for whilst adding cost-effectiveness and finally by adhering to the number one Powersystems moto of "Safety First".

During the project there were a number of challenges that presented themselves and Powersystems engineers were at hand to provide full support to the client to help overcome any challenges through our excellent engineering knowledge and experience, which enabled the client to smoothly and successfully complete the project.

Powersystems worked closely with the project partners in order for the client to meet their deadlines that included arranged G99 testing date of 18th January 2021. To achieve this, Powersystems engineers worked with the customer to prioritise the work tasks which resulted in the customer being able to generate power at the set target date to avoid costly penalties.

The list of responsibilities tasked to Powersystems can be summarised by the below;

- ▶ Electrical design
- ▶ Interface with SPEN to co-ordinate any DNO requirements
- ▶ Switchgear installation and commissioning
- ▶ Transformer installation and commissioning
- ▶ Cables & containment design, supply & installation
- ▶ HV testing
- ▶ Senior Authorised Person (SAP) provision



Installation works

Following the design stage, the installation work listed below was undertaken and completed;

- ▶ Installation of HV CT's to the site incomer cable box including SAP attendance and a controlled site shutdown
- ▶ Cable containment installation routing through the factory, crossing the main HGV route across a high-level pipe bridge into the CHP compound at roughly 110m and minimum install height of 4m
- ▶ 0.4 kV cable installation – 11 no. 300 mm² copper AWA/ SWA/XLPE/PVC cable at roughly 110m was installed on to a cable ladder system routeing between the clients existing switch room though to the CHP
- ▶ Small power, control and signal cables were installed for various LV equipment such as, the LV distribution board and the Argand system
- ▶ Earthing - this included the Circuit Protective Conductor (CPC) and all other relevant supplementary bonding
- ▶ Argand System Panels – these panels were designed to provide the site load reference which was communicated to the CHP control panel via a fibre optic communication connection and allow generator modulation. The panels also provide for a G99 constraint scheme.

Commissioning works

- ▶ Electrical installation certificate completed on newly installed LV circuits
- ▶ Insulation resistance testing of all control and signal cables
- ▶ Functional testing of all newly installed equipment
- ▶ G100 testing as a part of the DNO witness tests.

Energisation works

- ▶ Provision of an 11 kV SAP to take control of Plastic Omnium's 11 kV network
- ▶ Provision of an 11 kV SAP to attend site to provide supervision and to undertake pre-energisation checks and issue safety documents to Powersystems operatives.



Environmental benefits

- ▶ Due to the fact that less fuel is burned to produce a given energy output and the bakery is avoiding the use of power from the grid which mitigates transmission and distribution losses therefore, the CHP reduces emissions of greenhouse gases and other air pollutants such as carbon dioxide, nitrogen oxide and sulphur dioxide.

Economic benefits

- ▶ The CHP will save the factory considerable amounts of money on their energy bills due to its high efficiency.
- ▶ Protection of revenue through onsite generation and improved reliability, the CHP can allow the factory to continue to operate in the event of an interruption of the grid supplied electricity providing the connection agreement allows for this.
- ▶ Less exposure to electricity rate increases, due to the fact less electricity is being purchased from the grid, the bakery will have less exposure to any rate increases.

The results:

The Plastic Omnium Edison Road CHP connection work was completed in line with the client programme against constricted timescales and within budget. The first generation to the factory was achieved on 19th January 2021. This project the third of four of BasePower CHP projects this year and exemplifies a long-term working partnership with Powersystems.



For more information

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