Permitting decisions

Bespoke permit

We have decided to grant the permit for Billingham Emulsion Plant operated by SNF Oil and Gas Ltd.

The permit number is EPR/VP3439YG.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It summarises the decision making process in the decision checklist to show how all relevant factors have been taken in to account.

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- shows how we have considered the consultation responses.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

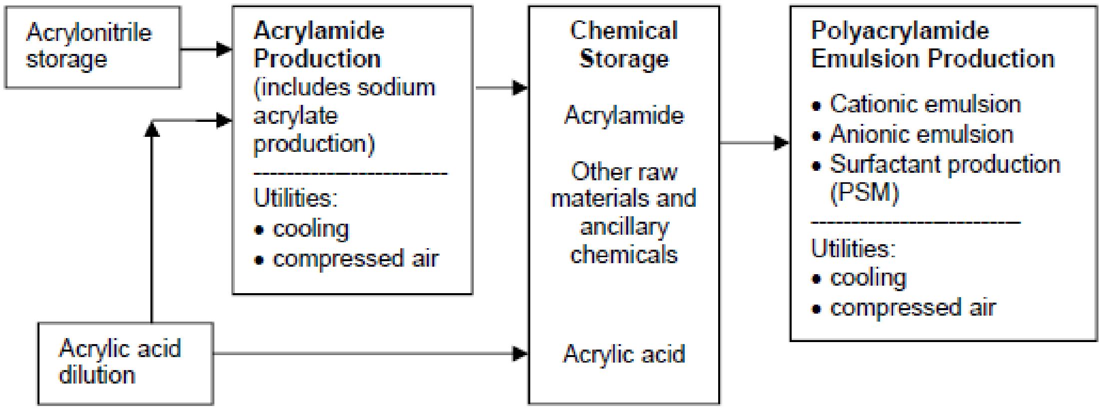
Read the permitting decisions in conjunction with the environmental permit. The introductory note summarises what the permit covers.

Key issues of the decision

Summary of the processes

The site produces anionic and cationic polymer emulsions. A number of products for use in the emulsion production process are also manufactured at the site; acrylamide, sodium acrylate and a surfactant (polymère surfactant maison (PSM)). We are satisfied that the production of sodium acrylate, acrylamide monomer and PSM at the site can be classed as the manufacture of intermediates. Although these products could be sold the Operator has no plans to do so and all of the intermediate products produced at the site will be used in the emulsion production process. This is reflected in the Opra profile for the installation.

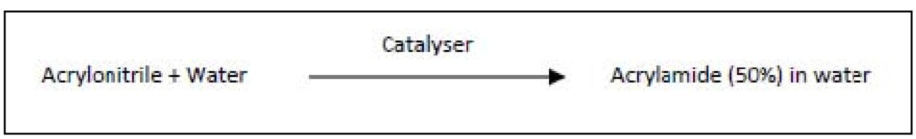
Below is a simplified diagram summarising the emulsion plant processes:



The main production processes are described in more detail below.

Acrylamide production

The acrylamide process is illustrated below:



Once the site is fully developed, acrylamide monomer will be produced on site (up to 100,000 tonnes per year) and used as a feedstock for the production of emulsions. All of the acrylamide produced will be an intermediate used in the emulsion production process, none will be transferred offsite for use elsewhere.

Acrylamide is produced using a continuous process at atmospheric pressure using low concentrations of acrylonitrile in multi-stage reactors. The reaction achieves 100% conversion. The reaction is exothermic and temperature is controlled by evaporative cooling.

There are two production buildings each able to contain two independent acrylamide monomer production lines operating continuously. The buildings are maintained at negative pressure to prevent escape of fugitive emissions. The purged air is directed towards a wet scrubber. Any deviation from normal operating conditions will result in automatic shut-down of the acrylonitrile injection pumps this immediately stops the reaction.

The acrylamide production line is made up of 2 stages, the reactor sector and the post reaction sector. The multi-stage reactors process acrylonitrile to acrylamide and stabilise the product. In this stage the concentration of acrylamide increases in each reactor until it reaches 50%. In the post reaction sector the pH is adjusted. If required, filtration can also be undertaken at this stage prior to on-site storage in tanks.

Storage tanks for acrylamide are located externally in a bunded area. The Operator has confirmed that all bunds at the site can contain either 110% of the largest tank or approximately 50% of combined tank storage capacity. Transfer pipes between the tanks and production buildings are fully welded. All external pipes are fitted with covers or insulation to prevent overheating that could result in self-polymerisation and pipe blockage. Transfer pumps are fitted with safety switches to stop the pumps if the temperature exceeds the high temperature threshold.

The storage tanks have conical bottoms and are cleaned once a year in order to avoid risk of contamination, which would lead to a destabilisation of the polymerisation inhibitor and increase the risk of accidental polymerisation. Storage is at atmospheric pressure and venting of the storage tanks takes place through scrubbers.

<u>Sodium acrylate production</u>

The sodium acrylate process is illustrated below:

Water + Acrylic Acid + Acrylamide+ Sodium Hydroxide → Sodium Acrylate

The process is carried out at atmospheric pressure and temperature, the reaction achieves 100% conversion. 40 tonnes per year of sodium acrylate will be produced in the acrylamide production buildings and is added to the 50% acrylamide solution as a stabiliser.

<u>Polymère surfactant maison (PSM) production</u>

The PSM process is illustrated below:

Solvent + MAA + Methacrylate Ester —(Catalyser)→ A Polymeric Stabiliser solvent solution

Surfactants are compounds that lower the surface tension between two liquids or between a liquid and a solid.

The surfactant, Polymère Surfactant Maison (PSM), is an in-house product that will be produced in the emulsion production buildings as a batch process (up to 22,650 tonnes per year). The process is carried out at atmospheric pressure with a reaction temperature of 80°C.The reaction achieves 99.8% conversion with the remaining 0.2% comprising of water which is directed to a scrubber. Scrubbers for the emulsion production buildings will be emptied regularly and liquid drained to the process waste water network.

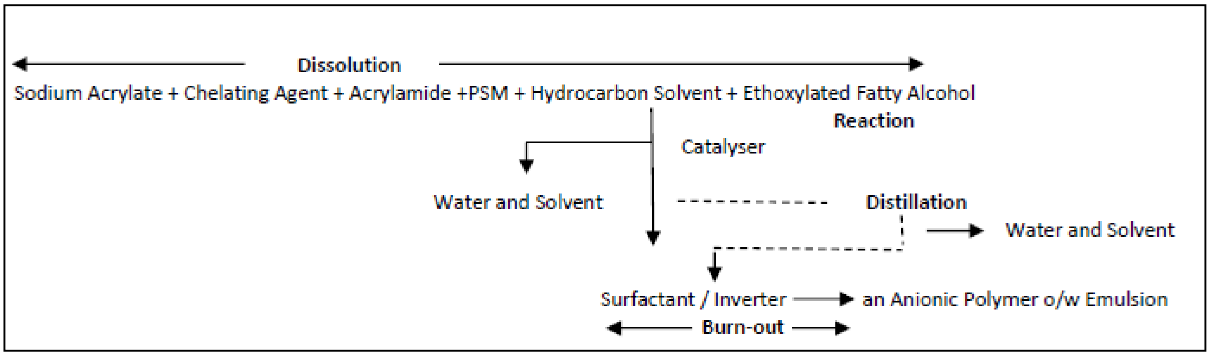
<u>Emulsion production</u>

Emulsion is produced on a batch basis in dedicated production buildings. The site will manufacture up to 160,000 tonnes of anionic and cationic polymer emulsions per year. The process involves four main steps: neutralisation, polymerisation, distillation (optional) and surfactant addition.

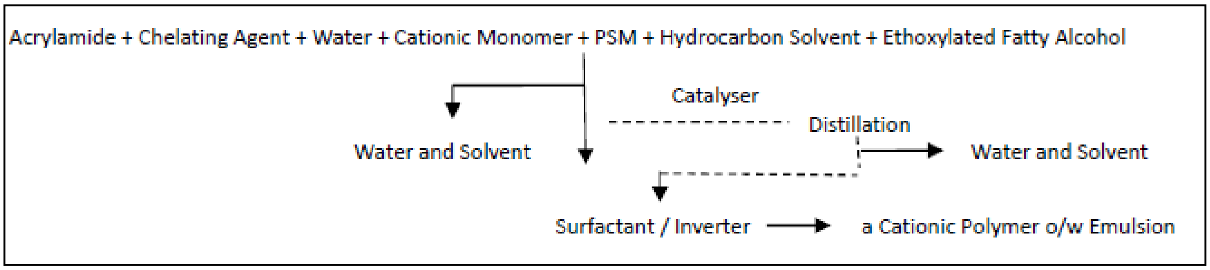
The neutralisation step mixes active ingredients and water using a cooling process to achieve the pH and temperature required prior to reaction. Depending on the type of emulsion being produced there are a number of possible process variations. For the anionic emulsion sodium acrylate is added as a stabiliser. For the cationic emulsion a cationic monomer is added.

The reactor is prepared with an injection of organic solution to which the active ingredients from the first step are pumped from the dissolution tank. This is passed through a homogeniser to achieve the desired viscosity under temperature control. Vacuum and degassing with nitrogen is carried out to remove traces of oxygen which would inhibit the polymerisation reaction. A catalyst (sulphur based) is then introduced to initiate polymerisation and a condensing process begins with by-products sent to the waste water treatment area and scrubbers. A surfactant (PSM) is then added in order for the emulsion to be dissolved in water when used by the customer. Depending on the product requirements there is an option to transfer the emulsion into a buffer tank, prior to the addition of PSM, where it can be distilled to increase the active content to the desired concentration.

The process for anionic emulsion is illustrated below:



The process for cationic emulsion is illustrated below:



Staged development

The plant will be developed in a number of phases. In the first phase, there will be one cationic and two anionic polymer production lines installed. During the first phase, acrylamide monomer will be imported and no acrylonitrile will be stored or used on site. Once the installation is fully developed, there will be a total of 16 emulsion production lines and acrylamide will be produced on site.

As far as possible the application and permit covers the processes that will be undertaken in the fully developed installation. The permit also covers the operation of temporary diesel generators, these are expected to be removed within two years once a connection to the National Grid has been installed.

Due to the staged nature of the development, we have included a pre-operational measure within the permit, requiring the operator to notify the Environment Agency prior to the start of each activity at the site:

> *The Operator shall notify the Environment Agency in writing at least four weeks before they start operation of any of the activities listed in Schedule 1 Table S1.1 for the first time. For all subsequent production lines relevant to the activity, the Operator shall notify the Environment Agency in writing a minimum of two weeks before the start of operations.*
>
> *This notification shall include details of any deviations from the commissioning reports approved under IC1. Any changes must be agreed in writing by the Environment Agency prior to commencement of the activities.*

We have also included the following pre-operational measure for future development, requiring an assessment of the proposed boilers to be submitted to the environment Agency before they are installed at the site:

> *3 months prior to installation of the boilers, the Operator shall submit a written report to the Environment Agency for approval, the report shall include the following:*
>
> *i. Detailed design(s) for the new boiler(s) including any proposed abatement, a finalised location plan and proposed operating regime.*

ii. *A review of the final detailed design/ plans for the new boiler(s) to ensure they will meet the requirements of BAT.*

iii. *An assessment of the environmental impact of emissions from the proposed boiler(s) to demonstrate that the emissions will not result in a significant impact on air quality.*

iv. *A proposal of suitable emission limit values in line with relevant legislation and the conclusions of the environmental impact assessment.*

Site condition report

The Operator provided a site condition report (SCR) which contains information on the previous land use and details of the geological setting of the site. The site is located in the Billingham area of Stockon-on-Tees, centred at National Grid Reference NZ 47246 22780. It covers approximately 16.7 hectares and is part of a former chemicals complex which had been cleared (to ground level). The site is located in an area comprising industrial premises, with the nearest sensitive receptors approximately 330 metres away.

Historical land use maps from the mid 1800's show the site was mainly surrounded by agricultural land with the Hartlepool Railway at the northern boundary and Belasis Lane to the north & west. Maps indicate that towards the end of the 19th Century development was beginning to encroach on the site, with brick works to the north and south. In 1917, a large chemical works was established in Billingham most likely making synthetic ammonia for the manufacture of explosives and later fertilizers. The land occupied by this installation previously formed part of that chemical works. In 1926 the chemical works changed ownership and by 1934 was used for plastics production, which continued up until 1989. Prior to the development of this installation the land was disused and derelict; complete clearance of above ground structures associated with the old chemicals complex occurred between 2006 and 2011.

The site has been the subject of a number of investigations prior to and during enabling works. Full details are given in document ref ST016175/0001/000/641/K/0003. A summary of these investigations is a follows:

An environmental review of the site was undertaken in 2006. The review included a site walkover assessment and a limited soil sampling and laboratory analysis programme. A total of seven surface soil samples were subjected to laboratory chemical analysis. The sampling was targeted towards areas where visual evidence of contamination had been identified, as well as locations of historical potentially contaminative processes. Some metals (copper, zinc and lead) were identified along with total petroleum hydrocarbons (TPH) in areas of notable hydrocarbon staining. Polychlorinated biphenyls (PCB) were also found to be elevated in one location. The report concluded a high potential for ground contamination beneath the site resulting from previous usage as a chemical works and the potential for asbestos containing materials to be present within building rubble.

In 2009 a phase 1 desk study and a phase 2 ground investigation was undertaken at the site. The investigation comprised excavation of 10 trial pits, one round of environmental monitoring and laboratory chemical analysis of soil and groundwater samples. Twenty soil samples were collected for analysis, no exceedances of commercial / industrial human health screening values were found. No phenols, benzene, toluene, ethyl benzene or xylenes (BTEX) compounds, PCBs or organochlorine pesticides were identified at concentrations above laboratory limits of detection. One sample was found to contain asbestos fibres. Leachate analysis results from 10 soil samples indicated elevated concentrations of naphthalene, chromium, copper and zinc. In addition leachable arsenic exceeded the UK Drinking Water Standards (DWS) in one sample, and leachable phenol exceeded the DWS in all but one sample. Groundwater samples were retrieved for laboratory chemical analysis from each monitoring location as well as from water from an underground structure. Copper, naphthalene, benzo(a)pyrene, anthracene, fluoranthene and phenol exceeded screening criteria, elevated levels were found to be concentrated at localised hotspots and were concluded to originate from the historic industrial activity at the site. The report concluded a limited potential for contamination on the site to pose a risk to human health, mainly via the presence of asbestos in one sample.

In 2012 a Land Remediation Scoping Study was undertaken. Soil samples for laboratory chemical analysis were obtained during the ground investigation. The results show that there was no clear distribution pattern of metal concentrations across the site, concentrations were found to be generally low with high concentrations restricted to only a few locations. The pH values varied from 5.9 to 12.0 across the site, although they were generally in excess of 7. Nitrogen species (ammonia, nitrate and nitrite) were identified in several locations across the site. This contamination was expected as nitrate and nitrite are degradation products of ammonia, and historical land use studies identified the site had previously been used for ammonia manufacture. Elevated concentrations of Polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH) were generally found to coincide with field observations of hydrocarbon residue staining, mainly concentrated to the south of the site. Asbestos was also detected within one metre of the surface at nearly half of the sampling locations across the site. Asbestos fibres within soils present a risk to human health, the inhalation of asbestos fibres can cause serious illnesses and significant harm to human health including malignant lung cancer, mesothelioma, and asbestosis (a type of pneumoconiosis). Any release of fibres would create a risk to human health as there is no safe lower limit. Once developed, the majority of the site will comprise hard standing. The presence of this hard standing and buildings will limit direct exposure of future site users to chemical contaminants and asbestos within the made ground.

The Sherwood Sandstone underlying the site is classified as a principle aquifer under the requirements of the Water Framework Directive. Beneath the Sherwood Sandstone lie bands of Permian Upper Marls, Anhydrite and Limestone. Devensian Glacial Deposits of laminated Clay (eastern areas of the site) and Glacial Lake Sand (western areas of the site) overlay the bedrock. Groundwater vulnerability maps show that the Glacial Lake Sand is classified as a Secondary A aquifer. Site investigations have identified made ground between 0.3 and 0.8 metres thick overlying the soft to firm sandy clay. The installation does not lie within a groundwater source protection zone and there are no anticipated emissions to ground or groundwater from the installation. There are no private water abstractions identified within 500 metres of the site.

There are no surface waters on site. However there are a number of surface water features in close proximity to the site, including Charlton's Pond approximately 330 metres to the northwest, Belasis Beck 350 metres to the north, the River Tees 780 metres to the south east and Billingham Beck 1680 metres to the west and south west.

There is one discharge point to surface water from the site. Cooling process purge water and uncontaminated rainwater from the site will be discharged to the River Tees via the Billingham industrial complex combined sewer (discharge point reference RT01, National Grid Reference NZ 48094 21900). This is an existing discharge point used by the wider industrial estate and the discharge from this site is expected to be small in comparison to the total discharge. See discharge to surface water section for further information.

There is also one discharge to sewer from the site. The discharge will consist of process effluent, chiller unit purge water and potentially contaminated rainwater. The discharge to sewer will be under a trade effluent consent from Northumbrian Water Limited prior to treatment at the Bran Sands Treatment Works. The Operator has provided a detailed site drainage and emission point plan for the installation and this has been incorporated into the permit.

The Site Condition Report also considers potentially polluting substances associated with the proposed emulsion plant operations and the measures to be taken to protect the land. All process, unloading and storage areas are surfaced with hard standing.

Storage and containment

There are no anticipated emissions to ground or groundwater from the installation. Fugitive emissions will be prevented by hard surfacing throughout site and by the use of bunds and kerbing in storage areas and production buildings where there is a potential for the release of liquids. The operator has confirmed that all bunds can contain either 110% of largest tank or approximately 50% of combined tank storage capacity. They have also stated that containment for the process buildings exceed 110% of the largest process tank and is equivalent to more than 25% of the total process capacity. We are satisfied that this meets the BAT requirements for the installation.

The following measures will be taken to minimise fugitive emissions to surface water, sewer, land and groundwater:

- There are automated detectors installed within the storage tank containments that will detect fire, smoke and gas leaks. Periodic camera inspections of potential leaks points will also be undertaken on a regular basis.

- Where required storage tanks are equipped with cooling and/or heating systems to maintain the temperature in the defined range. Temperatures are monitored and controlled where appropriate to the product being stored and the integrity of the storage vessel.
- All process, unloading and storage areas are protected by hard surfacing.
- In hard surfaced areas where contamination could occur (including buildings, unloading areas and storage bunds) any wastewater, spillage or surface runoff water is discharged to the process effluent drainage system.
- Water resistant membranes encased in the concrete during construction have been used to ensure the joints between the containment bund slabs and walls are impermeable.
- Spill kits will be available to contain spills and avoid contamination to the other areas.
- A programme of preventative maintenance will be undertaken at the site. Inspections will be regularly performed and refurbishment carried out when necessary.
- Corrective maintenance will ensure critical spare equipment to will be kept on site in order to manage and minimise the impact of breakdowns. Inspection and maintenance requirements have been defined for all items of individual plant.
- Preventative maintenance and inspection of the installation will be performed including the civil structures. A yearly survey of the bunds will be undertaken.
- Regular cleaning and inspection of sub-surface channels will be undertaken with a camera system to check for leaks.

These measures will protect the land from future pollution and also limit direct exposure of future site users to chemical contaminants and asbestos within the made ground. Hard surfacing and containment bunding will be installed within buildings and tanks farms to ensure that any spills or liquid releases are captured in the process waste water system.

We agree that the site has adequate surfacing and pollution prevention measures; meaning there is a low risk of pollution to soil and groundwater.

Assessment of Best Available techniques (BAT)

As part of their application the operator has submitted a BAT assessment (document reference: 60K41104/000/K/641/001 Appendix E (E1)) which compares their operating techniques against the indicative BAT taken from our Sector Guidance Note for the production of large volume organic chemicals (EPR 4.01). We have reviewed the measures proposed by the operator and compared them against the indicative BAT set out in EPR 4.01, we agree that they represent BAT for the installation.

They have also submitted additional BAT assessments comparing the operating techniques against the BAT Reference Documents (BREFs) for the Production of Polymers, Emissions from Storage, Industrial Cooling Systems, Energy Efficiency and Large Volume Organic Chemical Industry (document reference: 60K41104/000/K/641/001 Appendix E (E2-E8)). We are satisfied that the measures proposed by the Operator represent BAT for the installation.

The Operator has confirmed based on their experience of operating similar sites in other locations around the world they have optimised all production steps at the new installation for maximum productivity and energy efficiency.

A summary of the key operating techniques incorporated in the Billingham emulsion plant is provided below:

- All bunds can contain either 110% of largest tank or approximately 50% of combined tank storage capacity.
- Formal risk identification, including hazard and operability (HAZOP) studies were completed for all operations.
- The management policies, systems and procedures are subject to routine review.

- Emergency equipment and procedures are in place to minimise the effect of potential incidents and accidents.
- Monitoring will be undertaken by an external contractor that holds the appropriate certifications under the Environment Agency's Monitoring Certification Scheme (MCERTS)
- The plant design includes the use of a new reactor technology (without cooling coils) which, along with the use of a new high pressure cleaning head, minimises the amount of waste water by minimising the frequency and intensity of cleaning required.
- Heat exchangers are used for cooling in the neutralisation and incorporation steps of emulsion production.
- Relief vents and bursting discs have been designed to ensure they vent to a safe location with adequate dispersion.
- Fugitive emissions are minimised. All process gases generated during operations, storage tank emissions and incondensable vacuum pump gas are collected and transferred to wet scrubbers prior to discharge to atmosphere.

Emissions to air

Emissions to air from the site can be divided into two categories, those from the production processes and emissions from combustion.

Production process emissions
The production process and associated storage facilities will emit small quantities of the organic compounds acrylic acid, acrylamide and acrylonitrile. Ammonia emissions will be produced during production of the post-hydrolysed anionic emulsions. A sulphur based catalyst will be used in the emulsion reaction and sulphur dioxide (SO_2) emissions will be associated with this process.

Emissions will be abated by wet scrubbing prior to discharge through stacks on top of buildings or on top of the scrubbers serving storage tanks. Several vent scrubbers will be installed in each production building, with the discharges combined for final emission to atmosphere through a single discharge stack per building. The organic chemical emissions will be absorbed in water, with the addition of caustic soda for acrylic acid vapours. Sulphuric acid will be used to capture ammonia and convert it into ammonium sulphate.

Emissions of acrylic acid primarily occur during unloading and transfer. The vapours generated through offloading, as well as minor emissions from circulation of liquid during storage, will be removed using a caustic solution scrubber. The Operator has confirmed that the scrubbers will be emptied regularly and the liquid drained to the process waste water network.

Gaseous emissions are continuously produced by the acrylamide production process. One double scrubber will be installed per production line. Emissions from the reactors, the finishing tanks and the post reaction tanks will be exhausted through the scrubbers by two fans working in parallel. Vapours will be scrubbed with demineralised water. The scrubber efficiency is anticipated to be 98%. The scrubber will be emptied regularly and the water returned to the acrylamide production building to be reused in the process.

In the first instance acrylonitrile will be offloaded from tankers. This offloading process has a vapour return line to the tanker therefore it has no associated emissions or any requirement for a scrubber. Ultimately as production facilities are expanded, it is envisaged that a pipeline maybe installed to enable direct transfer to the installation. This would require a scrubber as there would be no vapour return line. In this case scrubbing would be achieved using demineralised water and the wastewater will be disposed of to the process waste water network.

Vent scrubbing for emulsion production is done in either two or three stages depending on the product specifications and manufacturing process. Firstly, emissions from the dissolution tanks will be scrubbed with caustic solution to remove acrylic acid. Where required, an additional scrubber (sulphuric acid solution) is used for the post-hydrolysis reactor to remove ammonia, this produces ammonium sulphate. Finally, emissions from the first (and second) stage will be mixed with emissions from the emulsion reactors, buffer tanks and other preparation tanks and scrubbed with caustic solution to remove acrylic acid and sulphur dioxide (SO_2) from the sulphur based catalyst. All scrubbers will be emptied regularly and liquid is drained to the waste water network.

Small quantities of volatile organic compounds (VOCs) may be emitted from the production processes and associated storage as fugitive emissions to air. An inventory of potential fugitive releases has been established as part of the hazard and operability study (HAZOP) undertaken during detailed design stage. The primary potential for leakage is from flanges, pump seals, valves and heat exchanger tubes. There are a number of operating techniques at the site designed to ensure fugitive emissions are minimised, including:

- the use of low volatility solvent
- reaction and distillations performed under vacuum
- magnetic drive chemical pumps for acrylonitrile, acrylic acid and acrylamide
- double screw pumps with double simple mechanical sealing for emulsion
- the installation is operated with a process control system that ensures that process parameters (flow, pressure, temperature, level, composition) remain within set limits. If necessary, this enables processes to be shut down quickly to minimise potential emissions (see accidents section for further information)
- critical spare equipment will be kept on site to manage breakdowns
- flanged or threaded valves and pressure relief valves to prevent damage and uncontrolled releases
- transfer pipes for the most hazardous chemicals will be fully welded to minimise leaks
- all production buildings are maintained at negative pressure to prevent escape of fugitive emissions
- all significant sources of VOC emissions are discharged through scrubber systems prior to point source releases to atmosphere

Combustion gas emissions

Combustion gases will be emitted from the temporary diesel generators. As there is no connection to the National Grid the plant will need to commence operation with electricity supplied from temporary diesel generators burning low sulphur fuel (<10 mg/kg). The Operator plans to operate the diesel generators for approximately two years until a permanent electricity supply line can be installed.

There are two sets of generators in buildings 5 and 10. For normal production operations, there will be a maximum of three generators operating at any one time. There is a spare generator in each group available for use if one of the others malfunctions or requires maintenance. Smaller generators will provide electricity for the site during non-production periods, when the demand is much lower.

After Phase 1 of the development, gas powered warm air heaters will be installed in the production buildings for provision of heating. Boilers may be required at a later date for generation of steam for distillation of emulsion to provide a more concentrated product. The warm air heaters and boilers, if installed, will be sources of combustion gases in later phases of operation, by which time the diesel generators will have been taken out of use. A variation of the permit will be required prior to the installation and operation of any items of combustion plant not currently covered by the permit. It should also be noted that any new items of combustion plant may be subject to the requirements of the Medium Combustion Plant Directive (MCPD) and this would lead to specific permit requirements and the need to meet emission limit values.

There will also be emissions to air from the proposed boilers, at the time of this permit determination there was insufficient information available to allow a full assessment of the boilers to be undertaken. We have therefore included pre-operational measure for future development 1 in the permit.

Air emissions

Assessment Methodology, application of Environment Agency H1 Guidance

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our guidance and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of your emissions

The H1 methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

Screen Out Insignificant Emissions

Once short-term and long-term PCs have been calculated (either by dispersion factors or modelling), they are compared with Environmental Quality Standards (EQS) referred to as “benchmarks” in the H1 Guidance. Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels.

PCs are considered Insignificant if:

- the long-term process contribution is less than 1% of the relevant EQS; and
- the short-term process contribution is less than 10% of the relevant EQS.

The long term 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The short term 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the proposed threshold provides a substantial safety margin to protect health and the environment.

Deciding whether Detailed Modelling is needed

Where an emission cannot be screened out as insignificant as a PC through applying the first stage of our H1 Guidance, it does not mean it will necessarily be significant.
In these circumstances, the H1 Guidance justifies the need for detailed modelling of emissions, long-term, short-term or both, taking into account the state of the environment before the Installation operates, where:

- local receptors may be sensitive to emissions;
- released substances fall under an Air Quality Management Plan;
- the long term Predicted Environmental Concentration (PEC) exceeds 70% of the appropriate long term standard, (where the PEC is equal to the sum of the background concentration in the absence of the Installation and the process contribution);
- the short term Process Contribution exceeds 20% of the headroom, (where the headroom is the appropriate short term standard minus twice the long term background concentration)

Air emissions assessment

The operator has undertaken screening using the Environment Agency’s H1 assessment tool. Emissions were considered from both the use of temporary diesel generators and the on-site production processes. The substances included in the screening were: carbon monoxide (CO), acrylic acid, acrylamide, ammonia, acrylonitrile, sulphur dioxide (SO_2), particulates (PM10) and nitrogen dioxide (NO_2).

Worst case measurement data from the production plants operated by SNF in France and/or from scrubber design specification data were used in order to estimate emission concentrations of acrylonitrile, acrylic acid, acrylamide and ammonia. Emissions of SO_2 are based on maximum use of a sulphur based catalyst in emulsion production involving 16 production lines. It is assumed that 95% will be removed by the scrubber.

Diesel generator emissions were based on supplier data. Only 3 generators are included in the emissions assessment, as that is the maximum that would operate at one time. No emissions data was available for the smaller generators (J220C2), so the emission parameters submitted by the Operator are conservative and assumes that emissions from all generators are consistent with the data provided for the largest generator of the three types used (V550C2). Two scenarios regarding operating conditions have been assessed to provide long-term and short-term impacts:

- Long-term: it is assumed that two of the V550C2 generators are operating at 80% load and one of the J220C2 generators is operating at 75% load. This is used to predict the long-term impacts as the plant will be operating in this mode approximately 86% of the time.

- Short-term: it is assumed that two of the V550C2 generators and one of the J220C2 generators are operating at 100% load. This is used to predict the short-term impacts as the plant will be operating in this mode one day a week, after a weekend power down period. This equates to approximately 14% of the time (one day per week based on 48 weeks operation per year).

Emissions from the smallest J165K units have not been modelled, the impacts will be substantially lower as they will only be running during non-production periods when the other generator are not operational.

Based on the H1 screening, we are satisfied that the impacts from emissions of acrylic acid, acrylonitrile, acrylamide and ammonia from storage, handling and production processes were screened out as insignificant.

The Operator also submitted detailed atmospheric dispersion modelling to assess the Installation's potential emissions to air against the relevant air quality standards. Detailed modelling was undertaken for the emissions which could not be screened out as insignificant by the H1 tool. The pollutants considered were sulphur dioxide (SO_2) emitted from the production processes and oxides of nitrogen (NOx), carbon monoxide (CO) and particulate matter (PM_{10}) emitted by the temporary use of diesel generators.

The proximity of solid structures, such as buildings, to an emission source can affect the dispersion of a plume. Buildings associated with the on-site activities were incorporated into the air dispersion model. We are satisfied that dispersion effects from these structures have been suitably considered in the modelling assessment.

Background concentrations were obtained from the closest continuous ambient air monitoring station at Billingham, it monitors NO_2, PM_{10} and SO_2. The Billingham monitoring station does not record CO data; therefore data from the Middlesbrough Breckon Hill AURN station data has been used.

We have considered the dispersion modelling and the predicted impacts at nearby receptors. The impacts have been shown to be not significant. Further details for nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and particulates (PM_{10}) emissions modelling are described below.

Nitrogen dioxide (NO_2)

The short-term modelling results at offsite receptors demonstrate that NO_2 cannot be considered insignificant according to our H1 criteria. The 10 percent threshold is exceeded at the closest receptors (The Grange Business Centre and Charlton's Pond). However, the modelling showed that for the majority of receptors the process contribution (PC) is below 10 percent of the short-term environmental standard.

The long-term modelling results at the majority of offsite receptors demonstrate that NO_2 cannot be considered insignificant according to our H1 criteria. The PC is more than 1 percent of the long-term environmental standard at all but two of the receptors modelled.

		Long-term		Short-term	
Ref	**Receptor**	**PC (µg/m^3)**	**PC as % AQS**	**PC (µg/m^3)**	**PC as % AQS**
1	Belasis Technology Park	1.71	4.27	17.16	8.58
2	Synthonia Sports Grounds	0.65	1.62	9.51	4.76

3	School (behind sports ground)	0.41	1.02	6.96	3.48
4	The Grange Business Centre	6.88	17.20	40.49	20.25
5	Chiltons Avenue	0.23	0.58	10.60	5.30
6	Hereford Terrace	0.67	1.68	9.58	4.79
7	Charlton's Pond	3.57	8.93	23.33	11.67
8	Billingham Beck Valley	0.11	0.28	3.18	1.59
9	Cowpen Bewley Woodland Country Park	0.53	1.33	7.30	3.65
10	Teesmouth & Cleveland Coast	0.49	1.23	6.97	3.49
PC – Process contribution; AQS - National UK Air Quality Standard					

Where emissions cannot be screened out a second stage of screening is required to take the background concentration of a pollutant into account by considering the Predicted Environmental Concentration (PEC). The table below gives a comparison of the long-term PEC and the short-term PC with the relevant AQSs. In line with our guidance, we have assumed the short-term background concentration is twice the long-term background concentration.

This stage of screening determines whether the long-term PEC exceeds 70% of the long-term standard, (where the PEC is equal to the sum of the background concentration in the absence of the facility, plus the process contribution) and/or the short-term PC exceeds 20% of the headroom (short-term standard minus twice the long-term background concentration).

		Long-term		Short-term		
Ref	**Receptor**	**PEC (µg/m^3)**	**PEC as % AQS**	**PC (µg/m^3)**	**PEC (µg/m^3) (PC + twice long-term background)**	**PC (µg/m^3) % of headroom (AQS - twice long-term background)**
1	Belasis Technology Park	20.91	52.27	17.16	55.56	10.62
2	Synthonia Sports Grounds	19.85	49.62	9.51	47.91	5.89
3	School (behind sports ground)	19.61	49.02	6.96	45.36	4.30
4	The Grange Business Centre	26.08	65.20	40.49	78.89	25.06
5	Chiltons Avenue	19.43	48.58	10.60	49	6.56
6	Hereford Terrace	19.87	49.68	9.58	47.98	5.93
7	Charlton's Pond	22.77	56.93	23.33	61.73	14.44
8	Billingham Beck Valley	19.31	48.28	3.18	41.58	1.97
9	Cowpen Bewley Woodland Country Park	19.73	49.33	7.30	45.7	4.52
10	Teesmouth &	19.69	49.23	6.97	45.37	4.31

	Cleveland Coast					
PC – Process contribution; PEC - predicted environmental concentration; AQS - National UK Air Quality Standard						

Having taken into account the background concentration, the short-term PC is less than 20% of the headroom at all but one of the closest receptors. At the Grange Business Centre the PC for NO_2 is 25.06% of the AQS objective value minus twice the long-term background concentration. However, there is still adequate headroom between the PEC and the AQS objective value to conclude that an exceedance of the NO_2 short-term AQS is unlikely. Also, any emissions will be temporary as the generators will be used during the first two years of operation, prior to installation of a permanent connection line for electrical supply from the National Grid.

The long-term PEC for NO_2 is less than 70% of the long-term air quality standard at all modelled receptors. Having taken into account the background concentration, we have concluded that long-term emissions are not significant and will not cause an exceedance of any human health air quality standard.

Sulphur dioxide (SO_2)

The assessment is based on the full development which comprises 16 emulsion production lines operating in three buildings. The initial development will only involve three production lines in a single building.

The modelling results demonstrate that SO_2 can be considered insignificant according to our H1 criteria. As shown in the table below, the PC is less than 10 percent of the short-term environmental standard at all of the modelled receptors. We are satisfied that the emissions from the site for all processes combined will not cause an exceedance of the AQS.

		15 minute		1 hour		24 hours	
Ref	**Receptor**	**PC**	**PC as % AQS**	**PC**	**PC as % AQS**	**PC**	**PC as % AQS**
1	Belasis Technology Park	0.39	0.15	0.22	0.06	0.05	0.04
2	Synthonia Sports Grounds	0.42	0.16	0.12	0.04	0.03	0.02
3	School (behind sports ground)	0.29	0.11	0.11	0.03	0.02	0.02
4	The Grange Business Centre	0.30	0.11	0.24	0.07	0.10	0.08
5	Chiltons Avenue	0.19	0.07	0.06	0.02	0.01	0.01
6	Hereford Terrace	0.34	0.13	0.12	0.03	0.02	0.02
PC – Process contribution; AQS - National UK Air Quality Standard							

Particulates (PM_{10})

We are satisfied that the temporary diesel generators will not result in significant emissions of particulates. The air modelling submitted by the operator shows that the PC is less than 10 percent of the short-term environmental standard at all receptors. The air modelling also shows that the PC is less than 1 percent of the long-term environmental standard at all receptors for PM_{10}. Therefore we are satisfied that the impacts from particulates will be insignificant at nearby receptors.

Carbon monoxide CO

We are satisfied that the temporary diesel generators will not result in significant emissions of carbon monoxide. The air modelling submitted by the operator shows that the PC is less than 10 percent of the short-term environmental standard at all receptors.

Impacts of emissions on habitats

There is one special protection area (SPA) and one Ramsar site within 10 kilometres of the site (Teesmouth and Cleveland Coast (SPA) (Ramsar)). There is one Site of Special Scientific Interest (SSSI) within 2 kilometres of the site (Tees and Hartlepool Foreshore and Wetlands (SSSI)). The SAC, Ramsar and SSSI extends over several areas which are around the site. The closest area is located approximately 1.06km from the site boundary (to the northeast). There are also five Local Wildlife Sites (LWS) and three Local Nature Reserves within 2km of the site.

No assessment was required, on the impacts of emissions to air from the diesel generators, on sites of heritage, landscape or nature conservation, and/or protected species or habitat due to the size of the combustion pant (approx. 1.8MW combined thermal input). The combustion processes at the installation are not considered 'relevant' for assessment under the Environment Agency's procedures which cover The Conservation of Habitats and Species Regulations 2010 (Habitats Regulations). This was determined by referring to the Agency's guidance 'AQTAG014: Guidance on identifying 'relevance' for assessment under the Habitats Regulations for installations with combustion processes.' Therefore the impact of combustion gases on Habitats sites have not been considered further.

The modelling undertaken by the Operator considered the impact of acid deposition from SO_2 emitted from the site at ecological receptors. Acid deposition from SO_2 screened out at locations closer to the installation than the SPA, Ramsar and SSSI, therefore we consider SO_2 emissions to air from the installation are not likely to damage the SSSI or have a significant effect on the SPA or Ramsar site. For these reasons we are also satisfied that SO_2 emissions to air from the installation will not have an adverse effect on the species or habitats at the other designated sites.

The H1 assessment submitted by the Operator shows that although ammonia emissions screen out for human health, the long-term impact cannot be screened out for ecological receptors. However, the inputs for the H1 assessment have been based on ammonia emissions from all three emulsion production buildings, using the benchmark value for ammonia (10 mg/m^3), which represents a worst case scenario. In practise, emissions are likely to be significantly lower than this; they will be abated by a scrubber and the post-hydrolysed anionic emulsion production process that emits ammonia will only be undertaken on a few production lines at any one time. Currently the Operator has not considered the impact of ammonia emissions at ecological receptors in their detailed modelling. Given the uncertainties regarding the timing of implementing the process and the final scrubber design we have included an improvement condition in the permit to ensure that the Operator undertakes an assessment of the environmental impact of ammonia emissions from the site once the actual emissions are known. The assessment must be based on monitoring runs taken over a 12 month period from all emission points associated with the post-hydrolysed anionic emulsion production process and outline any proposed improvements to reduce the impact if necessary.

Emission limit values (ELVs) - air

The operator has used worst case measurement data from their production plants in France and design specifications in order to estimate emission concentrations of acrylonitrile, acrylic acid, acrylamide and ammonia. Emissions of SO_2 were based on maximum use of a sulphur based catalyst in emulsion production involving 16 production lines.

We have set ELVs in the permit for acrylonitrile vapour, acrylic acid vapour, acrylamide vapour, ammonia and sulphur dioxide. It is considered that the ELVs will ensure that significant pollution of the environment is prevented and a high level of protection for the environment secured. As detailed below, these ELVs are in accordance or better than indicative BAT:

- *Acrylic acid vapour:* acrylic acid is classed as a Class B VOC and the Benchmark Value given in the Organic Chemicals Sector Guidance Note (EPR 4.01) is 75 mg/m^3. Although 75 mg/m^3 screened out when input and processed through the H1 screening tool, it is much higher than the emission values the Operator has said they can achieve (based on the French production plants). The Operator gave emission values of 10.8 mg/m^3 (short-term) and 2.22 mg/m^3 (long-term), we have taken these into account together with the benchmark and set an ELV of 25 mg/m^3 for acrylic acid vapour.

- *Acrylamide vapour:* the Benchmark Value for acrylamide is 5 mg/m³. However this does not screen out when processed through the H1 screening tool, it is also higher than the emission values the Operator has said they can achieve which ranged from 0.00247-0.012 mg/m³. We have taken these into account together with the benchmark and set an ELV of 0.1 mg/m³ for acrylamide vapour. This is significantly lower than the Benchmark Value, but allows adequate operational head room above the emission levels the Operator has said they can achieve. The H1 assessment methodology is highly conservative and it is likely that background levels of acrylamide are low, so although 0.1 mg/m³ does not screen out using the H1 tool we are confident that this emission limit will not lead to an exceedance of any of any human health air quality standard.

- *Acrylonitrile vapour:* the BAT Reference Document (BREF) for Large Volume Organic Chemical Industry states that acrylonitrile emission concentrations of < 5 mg/m³ can be achieved using scrubbing systems. The Operator has said they can achieve emission values of 2.03 mg/m³ (short-term) and 2.22 mg/m³ (long-term) (based on the French production plants). 5 mg/m³ screened out when input and processed through the H1 screening tool. We have therefore set an ELV of 5 mg/m³, in line with the BREF, for acrylonitrile vapour.

- *Sulphur dioxide:* the Benchmark Value for sulphur dioxide by wet scrubbing is 50 mg/m³. Although 50 mg/m³ screened out when input and processed through the H1 screening tool, it is much higher than the emission values the Operator has said they can achieve, this ranged from 2-3 mg/m³. We have taken these values into account together with the benchmark and set an ELV of 10 mg/m³ for sulphur dioxide.

- *Ammonia:* the Benchmark Value for ammonia is 10 mg/m³, this is in line with the value the Operator has said they can achieve. 10 mg/m³ screened out when input and processed through the H1 screening tool. The ELV for ammonia has therefore been set at the benchmark level (indicative BAT) as detailed in the Organic Chemicals Sector Guidance Note (EPR 4.01).

We are satisfied that the new limits are consistent with the application of best available techniques at the installation and that the new limits will be achievable based on current performance of the Operators other plants and/or manufacturer's design specifications.

Under the current Defra consultation on implementation of the Medium Combustion Plant Directive additional requirements are proposed for control of diesel generators for protection of air quality. Under the proposals, the diesel generators at the site would be classified as "Tranche B" on the basis that in aggregate they have a rated thermal input of greater than 1MWth. This would lead to specific permit requirements and the need to meet emission limit values. However, we have not set ELVs for the diesel generators at this time, this is because a connection to the National Grid is planned for completion in 2018, it is expected that the generators will be removed before the requirements come into force. If the generators are still in place at the site once the Medium Combustion Plant Directive is implemented then the relevant ELVs will be set as appropriate.

Discharge to sewer

There is one point source emission to sewer from the site. The discharge will consist of process effluent, chiller unit purge water and contaminated rainwater. The discharge to sewer will be under a trade effluent consent from Northumbrian Water Limited (NWL) prior to treatment at the Bran Sands Treatment Works.

The waste water will be combined in the wastewater collection pool prior to discharge on a batch basis. The waste water will pass through a buffer tank with adjustment for pH as necessary during the discharge. This is achieved by bubbling carbon dioxide through the water to lower the pH. Following pH adjustment, the effluent will be continuously monitored for flow as it is discharged from the site to sewer. In addition, 24-hour composite samples will be collected for analysis to confirm compliance with the trade effluent discharge consent.

The sources that make up the effluent and their management prior to discharge to sewer are described in more detail below:

- *Distillation and reaction process effluent:* During the distillation and reaction processes, a mixture of water with traces of oil is condensed and recovered in a condensate tank. Condensate is continuously withdrawn and discharged into decanters/separators to allow the removal of oil. The residence time allowed for separation is 29-37 hours, after which the effluent will be transferred by gravity through a purpose designed underground drainage system to the wastewater collection pool. This has been identified as the primary source of high chemical oxygen demand (COD) wastewater.

- *Reactor cleaning effluent:* High pressure hot water will be used to clean the reactors during maintenance. This will be transferred by gravity through a purpose designed underground drainage system to the wastewater collection pool. This is considered to be only an occasional source of high COD effluent, it comprises less than 1% of the total volume to be sent to sewer from the site.

- *Cleaning effluent:* Contaminated water will be generated from routine cleaning and the removal of any spills. This will be discharged via the dedicated effluent drainage system into the wastewater collection pool. The quantity of water from this source will vary depending on operational need. However, the Operator has confirmed that the generation of wastewater from cleaning will be kept to a minimum by utilising good practice based on previous operating experience at other sites.

- *Purge water from the chiller units*: The chiller units are cooled with water that is treated with a bromine-based biocide and a phosphate-based anti-scalant. The anti-scalant is corrosive, but not considered hazardous in the environment. In order to maintain the necessary water quality continuous purging of a small volume of water from the system is required. The purged water is directed to the wastewater collection pool prior to discharge to sewer.

- *Run-off water from bunds and unloading areas:* due to the potential for contamination, rain water from bunds and unloading areas will be discharged into the wastewater collection pool prior to discharge to sewer.

In the event of an accidental product release or large spill, on site runoff will be directed to the wastewater collection pool and the contents will be removed by tanker for off-site disposal instead of discharging to sewer.

The Operator undertook a screening of the emissions to sewer from site using the Environment Agency's H1 assessment tool. The H1 assessment found no parameters likely to be present in the effluent exceeded the insignificance threshold tests. It is therefore concluded that there will be no significant impact to the River Tees as a consequence of the indirect discharge of process effluent via the NWL Bran Sands treatment works.

As is standard for this type of discharge we have not set limits within the permit, instead this discharge is subject to limits set within the trade effluent discharge consent from NWL and emission limits will also apply to the final discharge into the River Tees from the NWL Bran Sands treatment works (this final discharge does not form part of this permit).

Discharge to surface water

Uncontaminated rain water and purge water from the cooling towers will be discharged to the Billingham Industrial Complex combined sewer system and subsequently to the River Tees via a discharge point RT01 (discharge point National Grid Reference NZ4809421900). RT01 is an existing discharge point already used by the wider industrial estate. The volume of the discharge to surface water from the installation is considered to be very small in relation to other discharges from the wider Billingham Industrial Complex. The principle user ('owner') of the discharge point is the Billingham Fertiliser Works. Compliance limits are already set for the final discharge to the River Tees, end of pipe monitoring is carried out on the final combined discharge and any breaches identified are investigated and reported to the Environment Agency.

The sources that make up the effluent from this installation and their management prior to discharge are:

- *Cooling system purge:* The water supply to the cooling tower will be treated with hydrogen peroxide and UV light for biological control. Regular purge of a proportion of the cooling tower water is required to prevent build-up of solids. The water quality will be continuously monitored for conductivity and a proportion of water will be purged when the threshold indicating solids build up is reached. This ensures that the UV treatment is effective as solids will not block the light.

- *Uncontaminated rain water:* Run-off water from normally uncontaminated areas (for example roads and roofs) will be collected in a tank and analysed prior to discharge. Where contamination is found above the limits allowed for discharge into the River Tees, the water will be discharged to sewer instead. Suspended solids in the rainwater run-off from roads and roofs are also reduced by settling prior to discharge.

There will be no sources of chemical contamination of the water from the site.

It is not possible to sample individual discharges in isolation at RT01. The Operator has therefore committed to carrying out monitoring on the discharge from their site before it joins the combined sewer. In addition daily monitoring of representative samples of the rainwater tank will be carried out, as well as analysis of 24-hour composite samples of the cooling system purge water. Within their operating techniques the Operator has committed to routine monitoring of suspended solids, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), total nitrogen, temperature, flow and pH, as well as visual checks for oil. They have specified that the discharge will not exceed the benchmark limit for suspended solids of 35mg/l and the pH range of 6-9.

In order to validate the description of the discharge given in the application we have included an improvement condition in the permit (IC4). This requires the Operator to conduct a review of the discharge from emission point W1 using monitoring data obtained during the first year of operation. If any pollutants are identified at levels above those that would be expected to be found in uncontaminated water, the origins of these contaminants must be investigated and their levels considered through an environmental impact assessment. With additional management controls and/or ELVs being proposed if identified as appropriate.

Raw materials

Raw material selection

The production processes require a number of specific chemicals and there is no flexibility with regard to selection of the primary feedstocks. However, there is some flexibility in the selection of ancillary materials at the site and the Operator has confirmed that where possible these have been selected to ensure the lowest potential environmental impacts. For example, the solvent selected for the emulsion production process has a high flashpoint which will ensure that volatile organic compounds (VOCs) will not be released at the temperatures involved in the process (specifically the solvent has been selected so as not to generate VOCs at temperature below 50°C).

Acceptance and storage of acrylonitrile

Acrylonitrile is the main feedstock for the process, it is a high hazard chemical and is highly flammable and toxic at low doses. The areas for unloading and storage of acrylonitrile are located in the southern part of the site, away from other facilities. Unloading will be performed on a dedicated unloading area with a concrete surface and a primary retention area connected to a remote spillage retention pit via a pipe., unloading will be performed under low oxygen air conditions. To minimise the risk of emissions to atmosphere and to limit the potential for ignition, unloading is performed under low oxygen air and in a vacuum (at a pressure of 100 mbar) with a vapour return line to the tanker.

The acrylonitrile will be transferred from the tanker to storage tanks via a pipe located in a concrete trench. Unloading and transfer pumps are equipped with a low and high electrical load detector to indicate pipe blockages, overheating or cavitation in the pump. The transfer lines are fully welded with a flanged end at the pump, in the case of pipe failure or in the event of any spillage from unloading or storage, the acrylonitrile will be diverted to the remote covered retention pit which provides tertiary containment.

The acrylonitrile storage tanks are separate to other areas of the site and are protected from sunlight by a heat shield. The storage tanks do not have low level flanges, this reduces the risk of accidental emptying due to a defective flange. The tanks are arranged horizontally in concrete pits with walls reaching just above the top of the tanks. The bottom of the pits are made of concrete with a slight gradient meaning any spillage from the tanks is diverted via a pipe to the remote spillage retention pit.

The contents of the storage tanks is kept stable by a low oxygen/high nitrogen blanket which maintains a low oxygen atmosphere to avoid oxygen polymerisation. Tank temperature is monitored, with automatic injection of water in the event that accidental polymerisation is detected.

Acceptance and storage of acrylic acid

Acrylic acid is also a high hazard chemical. It is used for pH adjustment of acrylamide, for preparation of sodium acrylate and as the aqueous phase for anionic emulsion.

A dedicated off-loading facility is provided for glacial acrylic acid, where it is immediately diluted to 90% in order to reduce its reactivity and the potential risk of explosion. It is then transferred to a dedicated storage facility at the north end of the site. Any vapours generated during unloading, transfer and storage are abated by caustic water scrubbers

All external pipes are fitted with covers or insulation to prevent overheating that could result in self-polymerisation and pipe blockage. The transfer pipes are fully welded. Transfer pumps are fitted with safety switches to stop the pumps if the temperature exceeds the high temperature threshold.

The diluted acid is transferred for storage in dedicated storage tanks at atmospheric pressure with temperature control and monitoring. The storage tanks are bunded, the bund is designed in accordance with BS EN 1992-3 (liquid retaining) and BS EN 19921-1 (structural use of concrete). Water and foam fighting measures are provided in the bunded area. In the event of a tank overfill or accidental spillage the acid will be diverted to a tertiary containment pit.

Acceptance and storage of other raw materials

The operator has confirmed that all bunds can contain either 110% of largest tank or approximately 50% of combined tank storage capacity. They have also stated that containment for the process buildings exceed 110% of the largest process tank and is equivalent to more than 25% of the total process capacity.

The solvent used in the production process is delivered to the site by tanker and unloaded into dedicated bunded storage tanks.

Caustic soda is received by tanker and unloaded into bunded storage tanks located in the emulsion production buildings.

Diesel will be delivered and stored in self-bunded tanks located on a hard surface outside of production buildings 5 and 10.

Other liquids supplied in bulk are also stored in bunded tanks. Working volumes of some chemicals are stored in tanks inside the production buildings and dry materials or materials purchased in smaller quantities are stored in a dedicated warehouse with provision for segregation, temperature control, explosion protection and venting as appropriate. The condition of equipment used for the containment of hazardous chemicals will be monitored and its condition maintained via routine inspections.

Waste

We are satisfied that the prevention and minimisation of waste has been considered during the site design processes. Where waste cannot be prevented consideration has been given to options for waste recovery. The following are examples of the operating techniques to be applied in order to minimise waste:

- Emergency stop controls on the production lines will halt production in the event of non-standard operating conditions or an emergency. This will prevent the production of low quality or off-spec products which may otherwise be classed as waste.
- The acrylamide production is a continuous process; any loss of pressure on the reactor head results in automatic closure of the valve on the stock tank and stops the reactor feed pumps. This minimises the consumption of materials during non-standard operating conditions which in turn results in the minimisation of waste products produced.
- Any off specification acrylamide will be mixed progressively into "good" acrylamide. Off specification emulsion is also blended with "good" emulsion where possible. If the quality of the emulsion does not allow blending, the unusable product is sent off site for incineration.
- The filtering process in the acrylamide post reaction process produces waste water which is reused in the process.
- Use of an internal heat exchanger and the redesign of the reactor in the emulsion process will reduce the frequency of cleaning and the amount of water used.

- Wastewater from the emulsion scrubber is re-used in the next dissolution batch.
- Oil from the emulsion reaction and distillation condensates will be separated from the process waste water and recycled back to the emulsion production process.

Only small quantities of waste are expected to be generated at the site. A range of different types will be generated, some of which are hazardous and the Operator has confirmed that all process areas will have a dedicated space for the segregation and storage of waste. Prior to transfer off-site for recycling or disposal, sorted and segregated solid waste will be collected and stored on-site in closed containers in a dedicated storage area on a hard surface.

Amenity issues

The installation is located in an area comprising industrial premises, with the nearest sensitive receptors approximately 330 metres away. The Operator has submitted a comprehensive risk assessment with their application which considers accidents and nuisance emissions (odour, noise and visible emissions). The Operator has concluded that the new plant is unlikely to cause nuisance to nearby receptors.

The site will keep a register of complaints which will be reviewed on a regular basis. In the event that any complaints about amenity issues are received, management of the causes will be re-evaluated and action taken to prevent a reoccurrence. The methods and frequency of associated monitoring will also be reviewed and amended if appropriate.

Noise and vibration

A detailed analysis of the potential noise emissions from the installation was carried out during the design stage and this concluded that through appropriate installation of mitigation measures and careful design, there will be no significant negative environmental impacts on sensitive receptors with respect to noise.

The main noise emitting sources associated with the installation have been identified as the air compressors, cooling towers, chillers, diesel generators and steam boilers (if fitted). These items of plant have been considered in the site design and strategically located in areas of the site where they are least likely to result in noise pollution outside of the site boundary. Air compressors, chillers and steam boilers will be fully contained within buildings in dedicated rooms with acoustical insulation to prevent noise egress. It is considered that the air compressors are likely to have the highest potential for noise and vibration, therefore they will also be fitted with silencers at the inlet and outlet of the fan. The cooling towers and diesel generators, which are external to buildings, are located centrally as far away from the site boundary as possible. Diesel generators are housed within a sound proofed enclosure with an integrated residential exhaust muffler.

During the commissioning phase of the site, noise emissions from significant sources will be monitored to ensure that levels conform to the equipment specifications. A preventative maintenance plan is in place to ensure that all items of equipment are maintained in good working order, this will help to minimise the potential for noise which may be caused by malfunctioning plant. In addition, the fabric of the buildings and unit enclosures will be maintained to ensure that the potential for noise from internal sources is kept to a minimum.

Following their assessment the Operator concluded that there will be no significant noise or vibration impact from the new installation and that there is little risk of noise related complaints. However, should any complaint about noise be received it will be recorded within the site’s Environmental Management System and investigated, with corrective action taken to address the source where appropriate.

We consider that the infrastructure and controls in place on site will minimise the potential for noise. We are satisfied that the standard noise conditions in the permit are sufficient and no additional measures are necessary at this time.

Odour

The operator has stated that odour is not expected to be an issue at the installation, this is based on operating experience at their other production sites and the design measures incorporated into the new installation. In over 20 years operation of the French plant there have been no complaints regarding odour.

On a chemical specific basis, emissions from the installation emitted through stacks or as fugitive emissions from associated pipework and plant were assessed for their potential to cause odour nuisance. It was concluded that the maximum predicted ground level concentrations from emissions are well below the individual chemical odour thresholds.

Potentially odorous substances at the site include acrylic acid and ammonia, these will be subject to full containment and emissions scrubbing prior to release of residual concentrations (see emissions to air section for further information). The plant has been designed to prevent and minimise all fugitive releases of chemicals, for the most odorous chemicals any development of any fugitive releases would be indicated by odours that would be easily detectable by the workers on site and this would trigger investigation and remedial actions.

Odour observations will be undertaken during commissioning and the first year of operation to verify that odour is not causing nuisance. This will consist of boundary line observations during a range of weather conditions as well as in the event of specified plant malfunction.

Based upon the information in the application, we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise pollution from odour. We are satisfied that the standard conditions, relating to odour pollution prevention and control, in the permit are sufficient and no additional measures are necessary at this time.

Dust

The majority of materials handled on site are wet/liquid and will not give rise to dust emissions. However there are a few raw materials which are supplied and handled in solid form (sodium acetate, a catalyst and diatomite) and these do have the potential to generate dust.

To minimise emissions, there will be no open storage of raw materials at the site. In the emulsion production building, sodium acetate will be transferred using a screw conveyor, designed to ensure very low risk of dust generation. Due to the small quantities involved sodium acetate in the acrylamide building and the catalyst in the emulsion building will be transferred manually. Diatomite will be transferred in the acrylamide building using a pneumatic system to prevent dust emissions.

Due to the nature of the activities on site there we are satisfied that the risk of dust being generated is low.

Accidents

Hazardous chemicals are used in the production process and are subject to stringent safety measures for their handling, storage and usage in order to prevent accidental release into the environment (see raw materials section above for further information). The operator also has a Hazardous Substances Consent from Stockton-on-Tees Borough Council for the storage of these chemicals.

The Operator has confirmed that the production processes have been optimised during the design of the installation. This is based on their operating experience at other plants and via the incorporation of best available techniques.

The installation is operated with a process control system that enables safe start up, continuous operation and controlled shutdown. The process control system ensures that process parameters (flow, pressure, temperature, level, composition) remain within set limits. The process control system is also designed to provide guidance to the operator on what action is required in the event of unexpected operating conditions. The system alerts the Operator via alarms and guides them through corrective actions to prevent the operation becoming out of control.

The use of automated detectors, camera inspection and routine monitoring of ambient air quality around the production and storage areas will ensure that any releases are quickly identified and rectified.

In the acrylamide process, any deviation from normal operating conditions will result in automatic shut-down of the acrylonitrile injection pumps which immediately stops the reaction. Should accidental polymerisation occur, the liquid can be discharged into a surge tank that is double the size of the reactor and would provide complete containment.

In the emulsion process, air is injected to immediately stop the reaction if there is a deviation from safe operating conditions. The reactors are equipped with a pressure rupture disk connected to a quenching tank. The tank is sized to take the full contents of one reactor if required.

The installation is also regulated as a top tier establishment under the Control of Major Accident Hazards (COMAH) regulations. This ensures that the potential for major accidents has been assessed and appropriate measures implemented to prevent such accidents and minimise the potential consequences should a major accident occur. A comprehensive assessment of accident risks has been undertaken which includes:

- assessment of major accident risks, including a predictive risk assessment
- details of the major accident prevention policy and safety management system
- technical aspects for accident prevention, control and mitigation
- emergency response arrangements

It is concluded that accident risks will be adequately controlled through the operating techniques implemented both for compliance with COMAH and as part of wider company policy.

Section 4.7 Part A(1) activity

Section 4.7 Part A(1): Any activity for the manufacture of a chemical which may result in the release of ammonia into the air, other than an activity in which ammonia is only used as a refrigerant.

Regulatory Guidance Series No 2, *Understanding the meaning of regulated facility* (RGN 2), states that, ‘in some cases two activity descriptions may seem similarly apt. Where this occurs, IED descriptions should generally be given precedence over ex-IPPC Directive or ex-IPC descriptions. Thus, in Chapter 4, any activity which meets one of the IED descriptions in Sections 4.1(a), 4.2(a), 4.3(a), 4.4(a), 4.5(a) or 4.6(a) should be given preference over any other Chapter 4 activity description which seems similarly apt.’

Based on the above we are satisfied that in this case the Section 4.1(a) activity is more appropriate, we have therefore not included a Section 4.7 Part A(1) activity in the permit.

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
Consultation	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website. We consulted the following organisations: • Local authority • Local sewerage undertaker • Public Health England and the relevant Director of Public Health • Health and Safety Executive • Local fire service • Natural England (for information only) The comments and our responses are summarised in the consultation section.
Operator	
Control of the facility	We are satisfied that the applicant (now the operator) is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits. The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.
The site	
Extent of the site of the facility	The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility. The plan is included in the permit.

Aspect considered	Decision
Site condition report	The operator has provided a description of the condition of the site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. • There is one special protection area (SPA) and one Ramsar site within 10 kilometres of the site (Teesmouth and Cleveland Coast (SPA) (Ramsar)) • There is one Site of Special Scientific Interest (SSSI) within 2 kilometres of the site (Tees and Hartlepool Foreshore and Wetlands (SSSI)) • There are also five Local Wildlife Sites (LWS) and three Local Nature Reserves (LNR) within 2km of the site. We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process. We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified. We have consulted Natural England on our Habitats Regulations assessments, and taken their comments into account in the permitting decision. An Appendix 4 form was also completed, concluding the activity is not likely to damage any of the features of the sites. This was saved to our Electronic Document and Records Management system for information only.
Environmental risk assessment	
Environmental impact assessment	In determining the application we have considered the Environmental Statement. We have also considered the planning permission and the committee report approving it.
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator’s risk assessment is satisfactory.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.
Operating techniques for emissions that screen out	Process emissions of acrylonitrile vapour, acrylic acid vapour, acrylamide vapour, ammonia and sulphur dioxide have been screened out as

Aspect considered	Decision
as insignificant	insignificant, and so we agree that the applicant's proposed techniques are BAT for the installation. We consider that the emission limits included in the installation permit reflect the BAT for the sector. As detailed in the key issues section, the emission limits are in accordance or better than indicative BAT.
Permit conditions	
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. Due to the staged nature of the development, we have included a pre-operational measure within the permit, requiring the operator to notify the Environment Agency prior to the start of each activity at the site. See key issues section for further information.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that the Operator submits a report on the commissioning of the installation and updates their Environmental Management System (EMS) as necessary following any changes introduced by commissioning. We have also imposed an improvement programme to ensure that the Operator conducts a review of emissions to air and water from the Installation using emissions monitoring data obtained during the first year of operation.
Emission limits	ELVs based on BAT have been set for the following substances: • Ammonia - 10 mg/m^3 • Acrylonitrile vapour - 5 mg/m^3 We have imposed a stricter ELV than that required by BAT for the following substances: • Acrylic acid vapour - 25 mg/m^3 • Acrylamide vapour - 0.1 mg/m^3 • Sulphur dioxide - 10 mg/m^3 It is considered that the ELVs described above will ensure that significant pollution of the environment is prevented and a high level of protection for the environment secured. Further details are given in the key issues section.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. These monitoring requirements have been imposed in order to ensure emissions are within ELVs and equivalent parameters. We made these decisions in accordance with The Production of Large Volume Organic Chemicals Sector Guidance Note EPR 4.01. Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS

Aspect considered	Decision
	certification or MCERTS accreditation as appropriate.
Reporting	We have specified reporting in the permit to ensure emissions are within ELVs and equivalent parameters and that the installation is being operated in an efficient manner. We made these decisions in accordance with The Production of Large Volume Organic Chemicals Sector Guidance Note EPR 4.01. Annual production tonnages and the other performance parameters: water, energy and raw material usage, will be reported under the Resource Efficiency Physical Index (REPI), therefore we have not included these reporting requirements in Schedule 4 of the permit.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions. The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.
Relevant convictions	The Case Management System has been checked to ensure that all relevant convictions have been declared. No relevant convictions were found. The operator satisfies the criteria in our guidance on operator competence.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because

Aspect considered	Decision
	the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Consultation

The following summarises the responses to consultation with other organisations and our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from
Stockton Borough Council – Planning, 21 June 2017
Brief summary of issues raised
Planning permission approval was given 24 October 2012 (application 12/1885/EIS). Stockton Borough Council have no further comments.
Summary of actions taken or show how this has been covered
No action required.

Response received from
Public Health England (PHE), 04 July 2017
Brief summary of issues raised
The main emissions of potential concerns raised by PHE are; • Point source emissions to air from diesel generators and storage tank venting and production processes including acrylic acid, acrylonitrile, acrylamide, ammonia and sulphur dioxide. • Fugitive source emissions to air from the storage and handling of VOCs and generation of dust. • Chemical emissions to water sources through accidents, chemical spills and other sources of water contamination. PHE's recommendation, based on the principle of reducing exposure insofar as is possible, is that NO_2 emission limits for the diesel generators should be set to be as low as practicable.
Summary of actions taken or show how this has been covered
Further information on emissions to air and water, emissions abatement and control, and emission limit values can be found in the key issues section of this document. The emissions to air have been screened out as insignificant and there will be no exceedances of the long or short-term ambient air quality standards (AQS) at any receptor locations. See the key issues section for further information. Emission limits have not been set for the diesel generators as they are individually less than 1 MWth and the H1 tool/ air modelling shows the emissions are insignificant. If emissions are insignificant then there is currently no requirement to set emission limits as emissions will be controlled by other parameters such as maintenance procedures. Further information on how we have assessed emissions from the diesel generators can be found in the key issues section of this document.