Appendix F Production of Polymers BAT Assessment

Agilent Environmental Permit Application: Redacted for the Public Register

Best Available Techniques & Operating Techniques

Agilent Technologies LDA UK Limited

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Assessment of Indicative BAT for Production of Polymers

The following table provides an assessment of the operation techniques carried out by Agilent against the BAT requirements contained within the Reference Document on Best Available Techniques for Production of Polymers.

It should be noted that the polymerisation activities undertaken at the Agilent site are undertaken on a relatively small scale in batch reactions with a total raw material throughput of around 185 tonnes per year, and polymer production of around 3 tonnes per year.

Hence, many of the BAT requirements applicable to larger production operations cannot be effectively applied to such small-scale operations.

Table F1 Best Available Techniques – Production of Polymers BREF

Guidance Section No.	Requirement	Operating to Guidance Requirement	Demonstration of BAT Compliance
General BAT			
BAT1	1. BAT is to implement and adhere to an Environmental Management System. An Environmental Management System (EMS) incorporates, as appropriate to individual circumstances, the following features: • definition of an environmental policy for the installation by top management (commitment of the top management is regarded as a precondition for a successful application of other features of the EMS); • planning and establishing the necessary procedures; • implementation of the procedures, paying particular attention to: • structure and responsibility; • training, awareness, and competence; • communication; • employee involvement; • documentation; • efficient process control; • maintenance programme;	Yes	1. Agilent will operate the site under their Environmental, Health and Safety Management System which conforms with all the requirements of BAT1. 2. The company wide EHS Management System is certified to ISO 14001 and externally audited. The site operates an Integrated Management System that is in accordance with ISO 14001. Agilent publish an annual ESG (Environmental, Social and Governance) report. 3. The decommissioning of new plant is considered at the design stage to ensure that all potential risks to the environment are mitigated during eventual decommissioning and demolition. Use of cleaner, more efficient technology is considered when replacing equipment.

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	• emergency preparedness and response; and
	• safeguarding compliance with environmental legislation.
	• checking performance and taking corrective action, paying particular attention to:
	  ○ monitoring and measurement (see also [32, European Commission, 2003]);
	  ○ corrective and preventive action;
	  ○ maintenance of records; and
	  ○ independent (where practicable) internal auditing in order to determine whether or not the environmental management system conforms to planned arrangements and has been properly implemented and maintained.
	  ○ review by top management.
	2. Three further features, which can complement the above stepwise, are considered as supporting measures. However, their absence is generally not inconsistent with BAT. These three additional steps are:
	• having the management system and audit procedure examined and validated by an accredited certification body or an external EMS verifier;
	• preparation and publication (and possibly external validation) of a regular environmental statement describing all the significant environmental aspects of the installation, allowing for year-by-year comparison against environmental objectives and targets as well as with sector benchmarks as appropriate; and
	• implementation and adherence to an internationally accepted voluntary system such as EMAS and EN ISO 14001:1996. This voluntary step could give higher credibility to the EMS. In particular EMAS, which embodies all the above-mentioned features, gives higher credibility. However, non-standardised systems can in principle be equally effective provided that they are properly designed and implemented.
			A programme of internal auditing is in place, with audits scheduled every 18 months. Benchmarking occurs against other Agilent sites.

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	3. Specifically for the polymer industry, it is also important to consider the following potential features of the EMS: • the environmental impact from the eventual decommissioning of the unit at the stage of designing a new plant; • the development of cleaner technologies; and • where practicable, the application of sectoral benchmarking on a regular basis, including energy efficiency and energy conservation activities, choice of input materials, emissions to air, discharges to water, consumption of water and generation of waste.		
BAT2	BAT is to reduce fugitive emissions by advanced equipment design (see Section 12.1.2.) Technical provisions to prevent and minimise fugitive emissions of air pollutants include: • use of valves with bellow or double packing seals or equally efficient equipment. Bellow valves are especially recommended for highly toxic services; • magnetically driven or canned pumps, or pumps with double seals and a liquid barrier; • magnetically driven or canned compressors, or compressors using double seals and a liquid barrier; • magnetically driven or canned agitators, or agitators with double seals and a liquid barrier; • minimisation of the number of flanges (connectors); • effective gaskets; • closed sampling systems; • drainage of contaminated effluents in closed systems; and • collection of vents.	Yes	The potential for fugitive emissions to be generated is low. No significant fugitive VOC emission sources are anticipated as: • The amount of raw materials inputted into the process is low at 185.09 tonnes per year. • Pipework is located indoors and is minimal. Pipework is maintained under a planned preventative maintenance system. • VOC transfers through pipework only occur intermittently as the process is batched. There is no continuous flow of VOC material in pipework. • Controls are in place where chemicals are transferred. • Chemical 2, chemical 3 and chemical 4 are all transferred to process via a Diaphragm pump from a DENIOS unit. These chemicals are delivered in sealed containers, transferred via minimal sealed indoor pipework into a sealed process that vents to a channelled emission point to air.

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	For new installations, these techniques have to be taken into account in the plant design. For existing units, they are applied step by step following the results of the techniques described in Section 12.1.3 and Section 12.1.4 (see BAT 3 and 4).		• Chemicals stored in 205 L drums are transferred into smaller containers within the drum store utilising air pumps. • The proposed process will operate under a preventative maintenance programme to manage equipment that could potentially result in diffuse emissions to air. • The processes use high integrity equipment. • The process is sealed with the exception of the vent system which directs VOCs to channelled emission points.
BAT 3	BAT is to carry out a fugitive loss assessment and measurement to classify components in terms of type, service and process conditions to identify those elements with the highest potential for fugitive loss (see Section 12.1.3).	Yes	Agilent utilises the SAP computerised system to track the inventory of solvents and their use. Any evident anomalies in VOC quantities supplied to site and used would be investigated. Agilent will review the need and options for management of fugitive VOC emissions.
BAT 4	BAT is to establish and maintain an equipment monitoring and maintenance (M&M) and/or leak detection and repair (LDAR) programme (see Section 12.1.4) based on a component and service database in combination with the fugitive loss assessment and measurement (see Section 12.1.3).	Yes	Agilent currently maintains equipment that may result in fugitive emissions through its preventative maintenance programme. This is supplemented by inventory tracking of VOC materials as noted above.
BAT 5	BAT is to reduce dust emissions (see Section 12.1.5) with a combination of the following techniques: • dense phase conveying is more efficient to prevent dust emissions than dilute phase conveying; • reduction of velocities in dilute phase conveying systems to as low as possible;	Yes	Dust is not a significant concern as most of the processing is wet. The final drying stages of the product are carried out in a sealed system.

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	• reduction of dust generation in conveying lines through surface treatment and proper alignment of pipes; • use of cyclones and/or filters in the air exhausts of dedusting units. The use of fabric filter systems is more effective, especially for fine dust; and • use of wet scrubbers.		
BAT 6	BAT is to minimise plant start-ups and stops (see Section 12.1.6) to avoid peak emissions and reduce overall consumption (e.g., energy, monomers per tonne of product).	Yes	Onsite production is solely on a batch processing basis. Plant operation is also optimised through computer monitoring and manual monitoring, depending on the process.
BAT 7	BAT is to secure the reactor contents in case of emergency stops (e.g., by using containment systems, see Section 12.1.7).	Yes	Emissions occurring during plant start-ups, shut downs and emergency stops are sent to existing vents. The process utilises sealed reactors and vessels. In the case of an emergency the product would be contained within the process equipment.
BAT 8	BAT is to recycle the contained material from BAT 7 or to use it as fuel.	Yes	Any material that resulted as waste from an emergency stop would be disposed of through the existing waste stream for waste solvent – for use as cement kiln fuel.
BAT 9	BAT is to prevent water pollution by appropriate piping design and materials (see Section 12.1.8). To facilitate inspection and repair, effluent water collection systems at new plants and retrofitted systems are, e.g.,' • pipes and pumps placed above ground; and • pipes placed in ducts accessible for inspection and repair.	Yes	New and retrofitted piping will to be above ground and accessible for inspection and repair. Existing pipework is minimal. Access to existing pipework is available, allowing for regular inspection and repair to occur.
BAT 10	BAT is to use separate effluent collection systems (see Section 12.1.8) for:	Yes	Wastewater routinely generated at the site comprises separately collected streams:

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	• contaminated process effluent water; • potentially contaminated water from leaks and other sources, including cooling water and surface run-off from process plant areas, etc; and • uncontaminated water.		• Process cooling and equipment wash water which is discharged to sewer; • Chlorinated and unchlorinated waste solvent (containing water) is stored in drums and collected twice a week and removed from site for reuse as cement kiln fuel; • Uncontaminated surface water in the southern portion of the site is discharged to soakaway (W1). • Uncontaminated surface water in the north of the site is passed through a 10,000L attenuation tank prior to being discharged to the Severn Trent storm water drain at discharge point W2. Contaminated water from potential leaks will be managed by use of spill kits. Any waste water generated from a leak or spill would be contained in drums and transferred offsite to a suitably licenced facility.
BAT 11	BAT is to treat the air purge flows coming from degassing silos and reactor vents (see Section 12.1.9) with one or more of the following techniques: • recycling; • thermal oxidation; • catalytic oxidation; and • flaring (only discontinuous flows). In some cases, the use of adsorption techniques may be considered BAT as well.	Yes	A recent review of the inventory has resulted in further assessment, including a BAT options appraisal and technology selection for waste gas abatement (refer Section 11.1.2 of the main BATOT report). The site is committed to installing the BAT option to ensure compliance with the BAT-AEL's and BAT operating techniques. A temporary scrubber will be used to reduce concentrations of compounds further whilst the new abatement system is being designed, commissioned and installed. Agilent intends that the upgraded waste gas abatement system should be operational by approximately Q3 2025.

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BAT 12	BAT is to use flaring systems to treat discontinuous emissions from the reactor system (see Section 12.1.10) Flaring of discontinuous emissions from reactors is considered BAT if these emissions cannot be recycled back into the process or used as fuel (see BAT 7 above).	N/A	Flaring systems are not utilised onsite; scrubbers are used to treat exhaust gases from the main production area.
BAT 13	BAT is to use, where possible, power and steam from cogeneration plants (see Section 12.1.11) Cogeneration is normally installed when the plant uses the steam produced, or where an outlet for the steam produced is available. The electricity produced can either be used by the plant or exported.	N/A	Agilent do not generate power and steam from a cogeneration plant. They have onsite boilers to provide heat demand (hot water) to the process, and electricity is provided from the National Grid.
BAT 14	BAT is to recover the reaction heat through the generation of low-pressure steam (see Section 12.1.12) in processes or plants where internal or external consumers of the low-pressure steam are available.	Yes	Agilent employs heating and cooling circuits using heat transfer oil which is most suitable for the small-scale batch processes that are carried out.
BAT 15	BAT is to re-use the potential waste from a polymer plant (see Section 12.1.15) Generally, the re-use of potential waste is favourable over landfill.	Yes	All waste generated at the site is sent either for recycling, re-use as cement kiln fuel, for energy generation or treatment. No waste is disposed of to landfill.
BAT 16	BAT is to use pigging systems in multiproduct plants with liquid raw materials and products (see Section 12.1.16).	N/A	Pigging systems are not employed for the process due to the minimal amount of pipework. Agilent clean systems using a jet spray and aqueous based detergent.
BAT 17	BAT is to use a buffer for wastewater upstream of the wastewater treatment plant to achieve a constant quality of the wastewater (see Section 12.1.17)	N/A	The site does not have an effluent treatment plant; chlorinated and unchlorinated waste solvent

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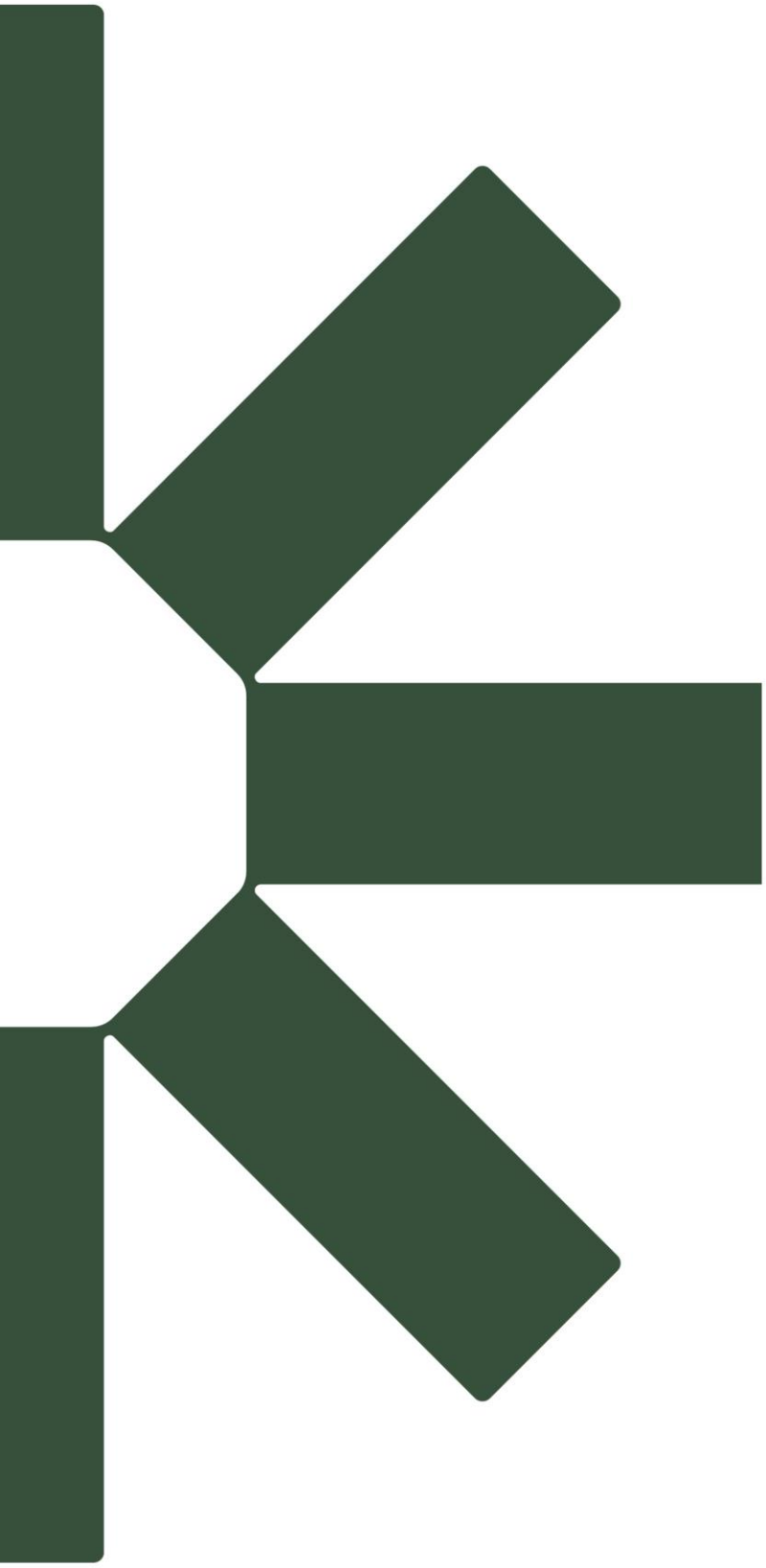
	This applies to all wastewater producing process, such as PVC and ESBR		(containing water) is collected for treatment and recovery off-site. Process cooling and equipment wash water is discharged to sewer for subsequent offsite treatment.
BAT 18	BAT is to treat wastewater efficiently (see Section 12.1.18). Depending on the wastewater quality, additional dedicated pre-treatment is required. Wastewater treatment can be carried out in a central plant or in a plant dedicated to a special activity.	Yes	Wastewater routinely generated at the site comprises separately collected streams: • Process cooling and equipment wash water which is discharged to sewer for subsequent offsite treatment. Due to the nature of this effluent pre-treatment is not required; and • Chlorinated and unchlorinated waste solvent (containing water) is stored in drums and collected twice a week and reused as cement kiln fuel, this effluent is treated to adjust pH before it is transferred offsite.



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