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Sigma Aldrich Ireland Ltd

IPC License P-0089-4
Date: March 2010

SIGMA-ALDRICH

Member of the Sigma-Aldrich Group

Sigma-Aldrich Ireland Ltd.
Registered in Ireland No. 259023 Registered Office: Vale Road, Arklow,Co.Wicklow, Ireland.
Directors: John Lewis(UK), Mike Harris (UK), Eric Green(USA), Graham Lucas(UK).)

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Definitions:

WWTP	Waste water treatment plant
PER	Pollution emission register
EMP	Environmental Management Programme
IPC	Integrated Pollution Control
IPCL	Integrated Pollution Control License
AER	Annual Environmental Report
HS and E	Health, Safety and Environment
SPC	Spill prevention and control
BATNEEC	Best Available Technology Not Entailing Excessive Costs
IPPC	Integrated Pollution Prevention and Control
BAT	Best Available technology

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1.0 Introduction:

In accordance with Condition 2.2 and 11.7 of IPPC License Register No P-0089-4, the Licensee shall submit to the agency, by the 31st March of each year an AER (Annual Environmental Report), covering the previous calendar year and which shall be to the satisfaction of the Agency. This report shall include as a minimum, the information specified in Schedule D: Annual Environmental Report Content. This shall be prepared in accordance with any relevant guidelines issued by the Agency. This report for March 2009 is the company's first AER since obtaining the fourth revision of the site's revised licence issued on 29th July 2009.

2.0 Company Profile:

Sigma Aldrich Ireland Ltd specialises in the manufacture of a wide range of active pharmaceutical ingredients for supply to client's worldwide for formulation into drug products. Sigma Aldrich Ireland Ltd was originally a private, family-owned independent company (Iropharm Ltd). It was established in 1982 on 7 acres of development land. An additional 8 acres of marsh was purchased from the Department of Forestry. The site is located just outside the Arklow town boundary. In 1983 planning permission was obtained for 4 buildings: 1 production Plant (360 m^2), 1 Pilot Plant/Warehouse (220 m^2), 1 two-storey Laboratory/office Building and 1 Boiler house.

Operations commenced in 1984. The equipment comprised 3 reactors, 1 distillation unit, 1 centrifuge and 1 dryer. The first product manufactured was 8-Chlorotheophylline, an intermediate for a motion sickness drug. Gradually further processes were developed by the in-house R&D department and additional plant was installed in the production building few years. A multipurpose warehouse was built in 1986, an administration building was added in 1988 and a second production building was erected in 1990. A second warehouse (Raw Materials warehouse) was completed in 1996.

Over the years both production capacity and GMP/HSE standards have developed and improved. In 1990/91, a water-treatment plant was installed. A solvent recovery distillation unit followed in 1992 and a purpose-built powder handling facility was completed in 1993.In 1996 a new production facility (P3) was commissioned. Iropharm Ltd was acquired by AlliedSignal, a multi national company based in Morristown, New Jersey, in 1997. In October 1997 the company was awarded its first Integrated Pollution Control (IPC) licence. Since obtaining the licence the company has continuously developed and improved its Environmental Management System and has made significant environmental improvements on site. In December 1999, AlliedSignal merged with Honeywell and the facility was renamed Honeywell Iropharm plc. In June 2006, the site was acquired by Sigma Aldrich Corporation, St Louis, MO. USA. From Jan 2009, all Sigma Aldrich activities in Ireland are being consolidated at Arklow and SAFC Arklow Ltd will trade as Sigma Aldrich Ireland Ltd.

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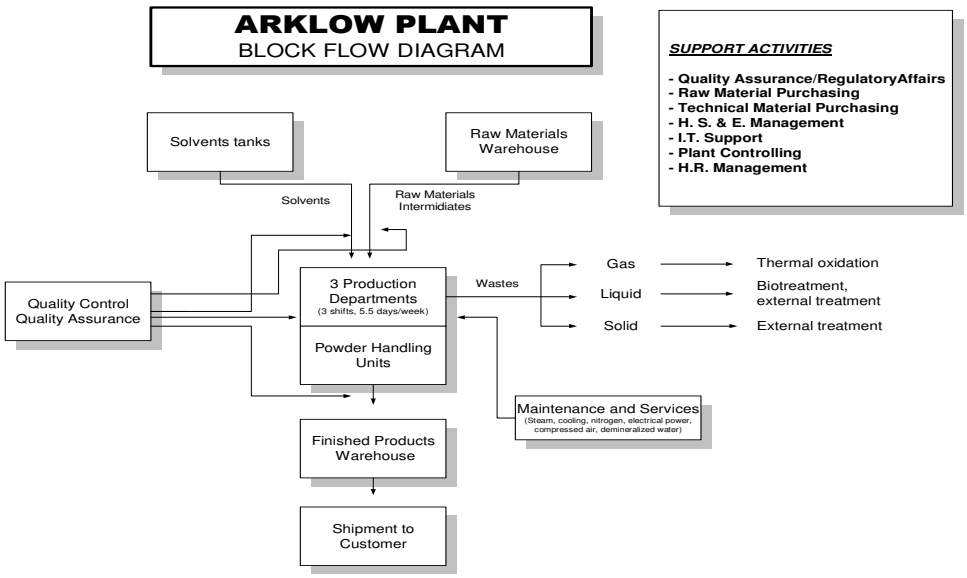
SAFC is the custom manufacturing section within Sigma Aldrich that focuses on both biochemical production and the manufacturing of complex; multi-step organic synthesis of API's and key intermediates. Sigma Aldrich Ireland Ltd site is part of this business unit.
It is the company's policy to operate safe and environmentally sound facilities, and also to take responsibility for and keep informed about, health, safety and environmental risks and standards. Sigma Aldrich Ireland Ltd, plant is located on the outskirts of Arklow, approximately 75 kilometres to the south of Dublin.

3.0 Company Processes:

The site is involved in batch manufacture of bulk active pharmaceutical ingredients and advanced API's. Around thirty products are made. The site is FDA inspected. The basic chemistry is based around Grignard reactions and a typical synthesis consists of an initial condensation reaction followed by purification by distillation, crystallization and purification steps.
Sigma Aldrich Ireland Ltd site at Arklow is capable of the following operations-
Batch processes
High temperature reactions up to 160°C
Low temperature reactions down to -10°C
Crystallisations
High vacuum distillations
Centrifugation of solids
Filtration of solids
Drying of solids under vacuum
Chromatographic separations
Milling of solids
Packaging of solids

A flow diagram of manufacturing activities at Sigma Aldrich Ireland Ltd is shown below



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Raw materials arrive into warehouse where they are assigned a unique identification number (raw material RM1 was the first on site the site is currently at raw material number RM 30400). Each container of the raw material is labelled and a "yellow" quarantine label. Samples are taken to QC for testing and released to the prescribed specification. If the material complies with the specification it is released and "Green" labelled by QC. The green label is placed over the yellow quarantined label on all of the containers. The material is now approved for use in manufacturing. If the raw material is rejected all containers are "Red" Labelled and returned to the supplier.

When manufacturing is required to run a process, they request a batch record and labels from QA. The batch number is unique and takes the following form B-ABC-XXX-YYY where ABC is a letter abbreviation for the product, XXX is the year of manufacture and YYY is the chronological number of the batch. This number appears on all documentation and containers relevant to the batch. When QA have issued the batch record, manufacturing input all of the required raw material lot number and quantity. The batch record is then issued to the warehouse where all of the required raw materials are assembled. The batch record together with the raw materials is transferred to the plant for manufacturing.

Intermediates isolated during the course of manufacture are drummed up pending transfer to the next stage. In-process samples are taken by manufacturing at various stages and tested by QC.

Description of the Production Activity
Sigma Aldrich Ireland Ltd manufactures bulk active pharmaceutical ingredients using batch chemical processes. A typical synthesis involves an initial chemical reaction followed by a series of crystallisation and/or distillation purification steps.

The following is a typical sequence of operations:

Raw materials are mixed with a solvent in a reaction vessel and a controlled chemical reaction takes place. The method for controlling the rate of reaction may differ depending on the process. For example, the addition rate of a liquid or solid suspension may be controlled, a specific temperature may be strictly monitored, or the pH of a solution may be kept within a specified range.

After the reaction has progressed to completion, the mixture is washed up by adding water and carrying out a phase separation. As the product is dissolved in solvent and the two phases are immiscible, the water phase is separated and removed.

The organic solvent is distilled off under vacuum leaving the crude product. The crude product is then transferred to a distillation unit and purified in a fractional distillation unit under high vacuum. This yields the purified product.

The purified product is transferred to a reaction vessel and dissolved in a suitable solvent. Then acid is added and the reaction vessel is cooled to crystallise the desired acid salt or the reaction mixture may be transferred through a carbon filter to another reaction vessel (known as a crystalliser) to be cooled and crystallised.

The slurry of crystals and liquid is transferred to a centrifuge or filter dryer to isolate the desired crystalline product. The mother liquor (waste liquid from isolation step) is pumped to a storage

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tank for solvent recovery or off-site disposal. If the crystalline material is an intermediate product, it may be further processed or sold as an intermediate. If the material an API it is dried, milled, sieved and packed.

When the batch is completed, QC samples all of the containers and a composite sample is tested. The containers are "Yellow" quarantine labelled and transferred to the warehouse to await release to the customer. All product containers in the plant are labeled as they are filled; equipment is labeled with batch number and name of the material in the equipment

(a) Finished Products.

Most finished products are Active Pharmaceutical Ingredients (APIs), also known as Bulk Pharmaceutical Chemicals (BPC's). They are used to manufacture formulated pharmaceutical products by SAFC customers worldwide. Each finished product is typically manufactured in 2 to 10 processing steps.

The following API's (BPC's) are currently manufactured by Sigma Aldrich Ireland Ltd

Product	***Application***
Acepromazine Maleate	Sedative
Amitriptyline-N-Oxide	Antidepressant
Amitriptyline HCL	Antidepressant
Armodafinil	Nacrolepsy
Brompheniramine Maleate	Histamine H1 antagonist
Butoconazole Nitrate	Antifungal
Clomipramine HCL	Antidepressant
Chlorphenoxamine HCL	Anticholinergic
Ciclonium Bromide	Spasmolytic
Doxylamine Succinate	Antihistaminic / Hypnotic
Halidor Fumarate	Vasodilator
Lofepramine HCL	Antidepressant
Mecloxamine HCL	Anticholinergic / Hypnotoic / Sedative
Nortriptyline HCL	Antidepressant
Isothipendyl HCL	Antihistaminic
Prothipendyl HCL	Antipsychotic
Promethazine HCL	Histamine H1 receptor antagonist / anti-emetic
Orphenadrine HCL	Muscle Relaxant / Antihistaminic
Orphenadrine Citrate	Muscle Relaxant / Antihistaminic
8-Chlorotheophylline	Advanced Intermediate
4-Chloro-n-Methylpipiridine	Advanced Intermediate

Note: Over the coming years, new products may be added to the range and some of the existing products may cease to be manufactured depending on market requirements.

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(b) Intermediates.

The facility currently manufactures a number of intermediates. These intermediates are the end result of a number of process steps and are used immediately or stored on site for use in further processes. Some of the intermediates are used on site for the production of final products and some are sold as advanced intermediates to other companies for further processing.

The following intermediates for sale are currently manufactured at the site:

4-Chloro-n-methylpiperidine
8-Chlorotheophylline
2, 6-Difluorobenzylalcohol
2- Fluoroacetophenone
2-Ethyl,-6-Methylbenzylalcohol
Methylphenylpyridinylcarbinol
Nortriptyline Ethyl Carbamate
R-ketoperhydroindole
S-ketoperhydroindole
Amag
Infinity

Note: Again this list may change depending on market requirements.

4.0 Licensed Activity

Solid and liquid materials are stored in racks in the raw materials warehouse. These may be raw materials or intermediate products received from outside suppliers. Solvents are stored in two tank farms to the east and west of the site.
Sigma Aldrich Ireland Ltd is an IPPC licensed plant. The company is required to be licensed under schedule 5.6, (the manufacture of pharmaceutical products and their intermediates) of the Environmental Protection Agency Act, 1992. Part 2 of the Protection of the Environment Act 2003 amended Part IV of the EPA Act 1992, which amends the Class under which the license is held.

The new class of Activity is Class 5.16, the use of Chemical or Biological processes for the production of basic pharmaceutical products.

The Company's first license was granted on 03rd October 1997, subject to the conditions as set out therein. A revised license was issued on 28th November 2000, to incorporate the operation of a new powder handling plant and a new waste air treatment plant.

In 2006 a review of the IPC License took place under section 82(10) of the Environmental Protection Agency Acts 1992 and 2003, to establish if it complies with the requirements of the IPPC Directive 96/61/EC. This review by the EPA was completed in 2006, and the site completed an IPPC License review application by 30 September 2006. On 13 December 2007, the company received its final determination to carry on the following activities:-
The use of a chemical or biological process for the production of basic pharmaceutical products and the recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this Schedule in respect of

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which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required.. This was reviewed again in 2007 to amend the NOX emission limit value and allow for re- distillation of solvents. The Final license on this review was issued by the Agency on 29 July 2009.

5.0 Summary Information:

5.1 Executive Summary:

Significant progress was achieved in either completing or performing work on many of the goals listed in the environmental management programme.

The site was successful in achieving certification to ISO14001:2004 Environmental Management System standard, 3 months ahead of schedule. A certificate was issued on 08 January 2008.Since this certification, there was no additional findings recommended in the surveillance audits which were completed in December 2008 and November 2009.

Work on the 1 of the goals is currently inactive. One the main targets included the improvement of the Waste air treatment plant performance in 2009. Results for 2005 were 98.7% and results for 2006 are 99.14% and 2007 was 98.94% and 2008 was 99.09%. A graphical representation of the runtime is in Section 13 of the AER.

To date a pollution emission register report has been completed on most of the compounds listed in the pollution emission register list. The EPER will be completed based on requirements established by the EPA to comply with the Requirements of the E-PTER Regulation (EC) no 166/2006 concerning the establishment of a European Pollutant release and transfer register and amending council directives 91/69/EEC and 91/ 61/EC and implemented into Irish Law through S.I. 123 of 2007.

Waste recovery has increased year on year, overall the total amount of waste recovered, reused , recycled on site was 89% for 2007 and increased to 93% in 2008, and 86% for 2009.
Other outlets were obtained for Waste solvent, to be re used as a fuel substitute in the bio-fuel industry. Work on this project earned the company the prestigious title of Responsible Care Award winner for the Environment category for 2006, and a commendation from CEFIC.

Natural gas consumption on site has increased slightly by 1%.

5.2 Summary of emissions

A summary of emissions is attached in section 13 of this report. The site goal was a 50% reduction in number of events reported. A 23% reduction was achieved. 2 complaints were received in 2009, with previous complaint recorded in 2005. There was 1 event relating to the malfunction of the effluent TOC meter, 2 events relating to Suspended Solids, 1 NONC for audit in Jan 2009, 2 spills, and 3 other Events- not non compliances but recorded on the site's register. Programmes are currently ongoing to prevent re-occurrence of such events. All other emissions were compliant with license requirements.

5.3 Agency monitoring and enforcement

In 2009 the site had four visits from the EPA. These were 27 Jan 2009, 11 June 2009, 27 Mar 2009, (Recci visit) and 25 May 2009 inspection

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The water monitoring division visited the site a number of times in 2009. Samples were taken on 06 Jan 2009, 12 Mar 2009, 20 July 2009, and 11 Nov 2009. Effluent analysis reports for the samples were received by the company from the EPA

The Air Monitoring Division visited the site in November 2009. Results of the samples taken are expected shortly.

5.4 EPA site visits/audits

The site had four visits by inspectors of the Agency in 2009.

On 27 January 2009 :1 non compliance to license i.e. emission limit value compliance suspended solids There was 14observations- 12 completed , 2 open and carried forward to next EPA audit i.e. monitoring pharmaceutical actives, RMP, diesel tanks, SW- TOC, Bunding, drum staging procedure, energy audit, CEMS, TO Bypasses.

11 June 2009:0 Non compliances, EPA noted positive efforts made by company. There was 7 observations –.all completed or in progress of being completed.

27 Mar 2009:- Recci visit- Follow up required, and completed

25 May 2009- Lab inspection, test methods and procedures were of a good standard. 8 observations Noted and all completed.

6. Environmental Management.

Commitment to environmental protection is one of the core philosophies of Sigma Aldrich Ireland Ltd. Wherever possible, raw materials used in processing are recovered, recycled or reused in the manufacture of subsequent batches of Product.

Special emphasis has taken place on energy conservation & waste minimisation projects in recent years. A measure of the site's commitment to environmental performance and continuous improvement is that the site won the IBEC 2006 Responsible Care Award in the Environment Category and also commended by Cefic for the European responsible Care awards for a waste solvent recovery project. A further submission on Community outreach activities was submitted to support Responsible Care efforts in 2009; Once again the site was commended for its efforts.

The Site's commitment to Environmental Management was further enhanced in 2007, by achieving accreditation to ISO14001:14004 Environmental Management system standards. This was achieved in December 2007, and registered in January 2008. Since then, there have not been any significant recommendations as part of the surveillance audits, demonstrating that the site is operating well to the standard.

6.1 Management Systems and Programmes.

The accreditation to the ISO 14001 Environmental Management system model provides the firm with fundamentals elements of an effective system that can be integrated with other management requirements and help assist in the achievement of the site's Environmental goals.

An Environmental Management Programme is a specific requirement of an Integrated Pollution Control License and was first submitted to the EPA in March 1998. This document (Environmental

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Management Programme) details issues such as projects and objectives in the environmental area and is updated as specific issues are progressed.

6.2 Resources

Senior Management commitment and leadership is crucial to the success of this environmental management system. Sigma Aldrich Ireland Ltd Site Leadership has agreed that the ISO 14001:2004 standard will serve as a framework for improvements in the site's existing environmental Management system, and which also forms an important part of each Managers performance appraisal.

The Site Director retains final responsibility for all environmental matters on site. The Environmental, Health and Safety Manager is the designated Management Representative for the implementation and operation of the Environmental Management System. The Environmental, Health and Safety Manager reports to senior management on performance against Site Goals and Targets, as laid down in the Environmental Management Programme.

Environmental responsibilities are not confined to the Environmental function. All managers are collectively involved in the Environmental Management System Review and all agreed decisions are documented accordingly. Individual managers may have direct responsibility for elements of the Environmental Management Programme or be designated as project leaders for specific Environmental Goals or Targets. All managers are required to promote continual improvement in their areas of responsibility.

The Supply Chain department is responsible for evaluating the environmental performance of suppliers in conjunction with the Environmental, Health and Safety Manager.

The Engineering department is responsible for Process Design implementation and preventative maintenance programmes.

The Safety, Environmental and PTG departments jointly evaluate the HSE impact of new process introductions, process improvements and equipment change controls.
HSE departments work closely on implementing HSE systems and procedures, for e.g. accident/ incident investigations, training programmes and Emergency response drills. Organizational responsibility charts are included in Section 4.1.3.

All employees are responsible for their own Safety, Health and Welfare and that of any other person that may be affected by their actions or omissions while at work. Employees are required to familiarize themselves with the site's environmental Policy, and actively participate in environmental matters, and avail of appropriate training and information.

Security personnel monitor employees, contractors and visitors entering and leaving the site. They also ensure that all visitors /contractors entering the site have appropriate PPE and have received appropriate site HSE induction training.

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Visitors and contractors must remain in frequent contact with site representative while performing work on site, and must be familiar with the Site's Environmental Policy, HSE rules and procedures, and must follow instructions given by their designated site representative at all times.

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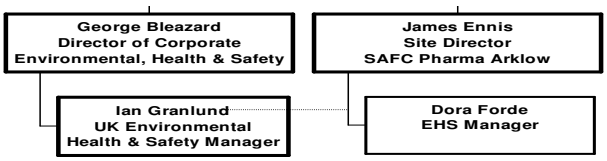
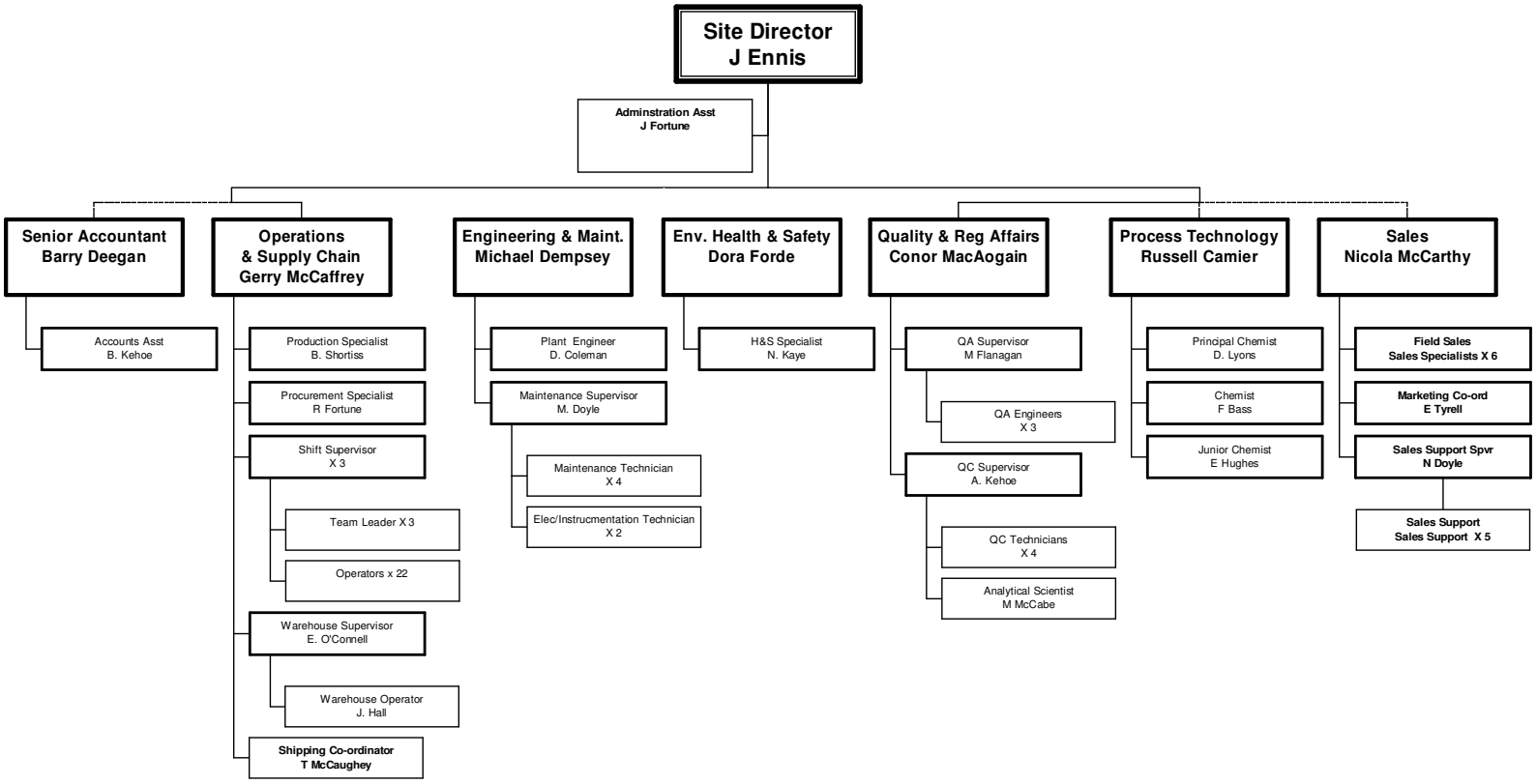
EHS Team Organisational Chart





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6.3 Corrective action

Within the Environmental Management System there is a procedure that details the list of actions when there is a non- conformance. Examples of non-conformance items are listed in the procedure.

Non-conformances are reported directly to the Environmental Manager in the form of an Incident/ complaint reports document. This document provides details of the location of the incident, duration, employees involved, description of the incident, materials involved, action taken as well as corrective and preventative action where applicable. The weather conditions and environmental significance of the incident is also documented.

The Environmental Manager and relevant departments, depending on the type of incident may carry out further investigations. This may include interviewing employees involved in or who witnessed an incident occurring. Tools used include Apollo, and incident investigation software tools, also help identify root causes without assigning primary blame on the employee involved. Details of these incidents are reported to the EPA as soon as practicable after an incident.

The site's environmental procedures for implementing this policy are EVP-014 and EVP-061. The company follows the EPA guidance ("Guidance to Licensees on the Notification, Management and Communication of Environmental incidents") in determining event significance.
EVP 091 "Procedure for determining environmental impacts and aspects" is also reviewed as part of the Non conformity corrective and preventative action tracking system.

6.4 Awareness and training

Sigma Aldrich Ireland ltd Arklow Training systems are outlined in procedure Proc-ark-pol-008936. Each new employee receives comprehensive induction training on relevant company's policies and systems. The Environmental Management System and other HSE requirements form a core part of this programme.
The Manager of each Department performs a training needs analysis on an annual basis. Environmental training is part of this review. Refresher training is periodically delivered to maintain skill levels or as dictated by system changes, job changes or corrective actions arising from investigations.
Job specific training is delivered as procedural, classroom and on-the-job training depending on job requirements or individual needs. Accredited external experts are contracted for specialized activity training
Refresher training is periodically delivered to maintain skill levels or as dictated by system changes, job changes or corrective actions arising from investigations.

Environmental awareness training was also provided to employees on site during Health and Safety week; however the focus from an environmental perspective was energy efficiency and resource use consumption and reduction. The awareness campaign was well received by all employees on site, and is an initiative that will be repeated at regular intervals.
Full scale emergency drills are routinely practiced in collaboration with the local emergency services. Task competency is evaluated through competency assessments.

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Full scale emergency drills are routinely practiced in collaboration with the local emergency services. Task competency is evaluated through competency assessments.
All contractors working at, or on behalf of, Sigma Aldrich Ireland ltd must undergo specific contractor training. This includes familiarization with the sites policies, systems and expectations. Records of all training are retained on file.

6.5 Legislative and Regulatory situation

Sigma Aldrich Ireland Ltd is currently regulated by the Irish Environmental Protection Agency under the Integrated Pollution Prevention Control Licensing Regulations. The introduction of these regulations in 1994 and also amended in 2003 has encouraged companies to adopt a structured and proactive approach to Environmental Protection and Management.

Procedure EVP-060 describes Sigma Aldrich Ireland Ltd Ark low's mechanism to ensure the company stays abreast of current and imminent HSE legislation. It also details how compliance with the Site's IPPC / IPPC license is achieved. An assessment of regulations is carried out at least once per year.

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Schedule of Environmental Objectives and targets for 2009.

Given the large Number of target, the company will continue to focus on the above goals and targets for 2009

Specific items to be addressed in the Environmental Management Programme 2009		
Target	**Goal Number**	**Target Date**
Track Thermal oxidizer performance. Improve thermal oxidizer "Uptime" and reduce number of bypasses by 50%	2.1	Dec 2009
Conduct a study to assess the elimination of carcinogens usage.	2.9	Dec 2009
Establish Toxicity testing programme for all main aqueous streams produced on site Pilot trials on High BOD streams in conjunction with Toxicity	2.14	Ongoing
Continual improvement in the Environmental Management system	2.16	Ongoing
Maintenance and calibration of all new equipment	2.17	Ongoing
Waste minimization Improve recycling programme and aim for 10% improvement on previous years figures	2.18	Ongoing
Pollution Emission Register (PRTR)	2.19	Ongoing
Residuals Management (10.2)	2.20	Reviewed annually
Environmental Liabilities (12.2.1)	2.21	Reviewed annually
Provide improved Environmental training	2.22	Reviewed annually
Noise	2.23	Repeated annually
Identify and source outlet for Biological sludge	2.27	Dec 2009
SBR Pilot data for all main aqueous phases	2.31	Dec 2009
Energy efficiency	2.35	Reviewed annually
IPPC License Review	2.40	Closed 2007
Fuel substitution project	2.42	Closed 2007
Solvent segregation project	2.43	Closed 2007
Efficient Process control (2.2.2.9)	2.44	Dec 2009
Pipe valve and gauge review (3.6.4)	2.45	Dec 2009
Heat recovery from Thermal oxidizer and efficiency (3.15) Cost feasibility study of fuel substitution	2.46	Dec 2009
Efficiency of septic tank(3.16), and report on Sanitary effluent	2.47	Jan 2010
Programme for the identification and reduction of fugitive emissions (6.9) Examine the need for a catchment system to collect any leaks from flanges and valves review(3.10)	2.48	Dec 2009
Assessment of performance of on site WWTP (6.12)	2.49	Annually
Annual review of Accident prevention procedure and emergency response procedures (9.1)	2.51	Annually

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Goal No	Target	Status	Completion date	Responsibility
2.1	Track Thermal oxidizer performance. Improve thermal oxidizer "Uptime" and reduce number of bypasses by 20%	Completed for 2009	Completed and ongoing for 2010	Engineering Manager/ Environmental Health and Safety Manager

Objective:
To improve thermal oxidizer runtime
To reduce the number of bypasses

Details:
Thermal oxidizer performance was given a strong focus in 2009. The annual performance is graphically represented in Section 13 of the AER relating to reported incidents / bypasses Summary for 2009. A full summary of all bypasses is also included in the appendices section of the AER.

Any issues relating to thermal oxidizer performance were discussed at the daily production meetings. Special thermal oxidizer meetings were set up on a regular basis. These meetings were attended by Managers from Engineering, Production, Research and Development, and supported by the Site Director.

There is significant improvement in many areas of operation. The main focus of these meetings was to focus on recurring bypasses, and identify ways of preventing them from happening in the future.
It must be emphasized that the majority of these bypasses are of short duration and are rectified within a time frame of less than 10 minutes.
The actions completed to date are as follows:-
The internal goal of 99% runtime for the thermal oxidizer was achieved. The actual runtime for the T.O was 99.09%.The total number of bypasses reduced by a further 24% on 2008 figures.

The total number of bypasses exceeding 1.0 hr duration was 30 in 2007 and 29 in 2008 and 27 in 2009
Scheduled downtime equated to 836 hrs of downtime. During this time all relevant processes were shutdown or the plant was not in operation.

Main causes of bypasses/ shutdowns for the year

- Power trips accounted for 22 hrs in 2009, 13.02 hrs in 2008 compared to 0.72 hrs in 2007
- Scheduled downtime was 836.5 hours in 2009, 824 hrs in 2008 compared to 774 hours in 2007
- Water pressure 5 event in 2009 at 24.5 hrs, 6 events in 2008 at 47.69 hrs compared to 5 events totaling 4.65 hrs in 2007.
- FID problems accounted for 49.58 hrs compared to 9.89 hrs in 2007.
- 2 events relating to a temperature probe

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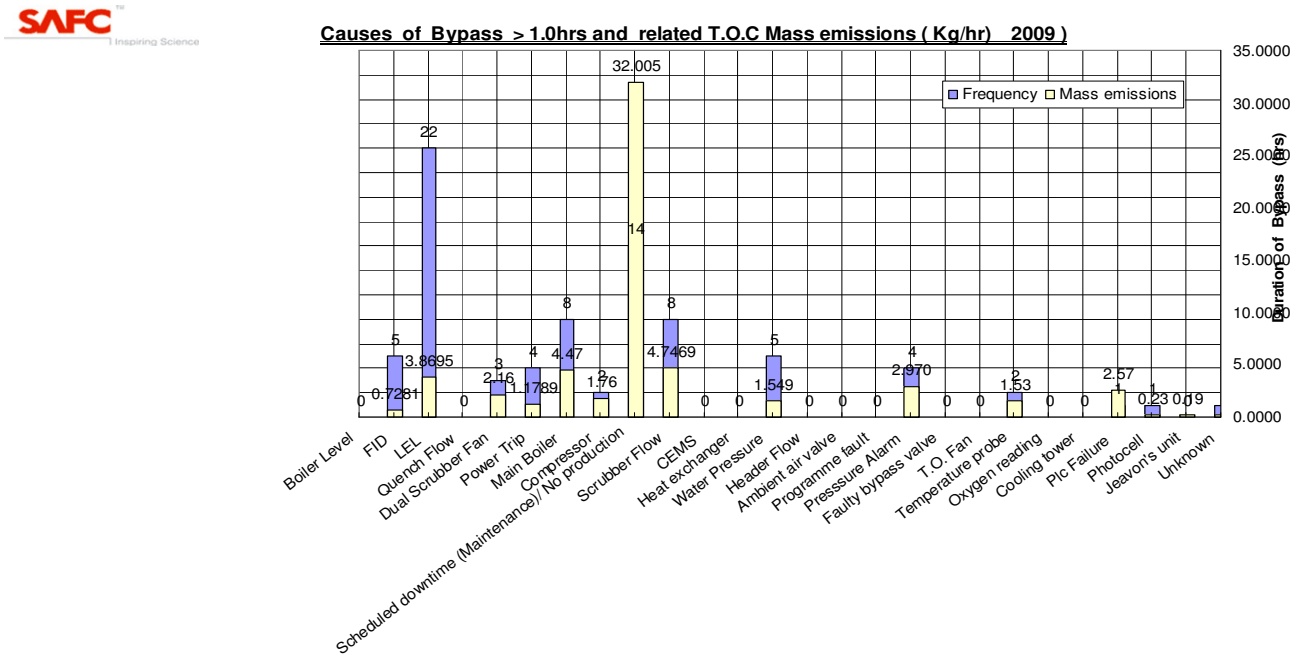
- Boiler level events were 8 in 2009 accounting for 13.5 hours downtime.
- FID events reduced from 10 to 5 events in 2009 these were related to servicing of units using an external contact company.
- Scrubber flow events reduced from 53.54 hrs in 2007 to 9.49 hrs in 2008 and 7.01 hrs in 2009

Processes causing bypasses in 2009:

MPPC

Main issue is by clearing loop with nitrogen after taking the sample. Modify batch sheet to instruct operator to shut the vent on A8 while sampling or additionally rinse the line with THF to be cleared at a later stage when reactor is under vacuum.-
Look at venting to A9 to provide buffering capacity
Look at scrubber solution by dampening down methane using an organic solvent
Prepare temporary process change for MPPC to combine acid with solvent in addition bottle



Improvements were identified in the following areas:

- Scrubber checked May bank Holiday. Routine amended on Pemac (Preventative maintenance Management system) to quarterly to empty down and inspect scrubber
- Dual scrubber scada page shows pump running but not circulating.
- UPS system on an annual service
- A14 distillate return, modified to prevent TO Bypasses from occurring. Change control issued 29 April 2009. This is particularly important for 4 Chloro processes
- Reviewed recurring bypasses over year. Issues with Main Boiler - Wire break on emergency stop. This was bridged for the interim, but scheduled for replacement by end April- completed

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- A Number of bypasses had occurred relating to softened water pressure, this is now resolved, A pressure pot and transmitter were replaced.
- Gas valve replacement completed in Q1 to reduce gas usage at TO
- CEMS flow meter calibrated April and July
- CEMS pump drawing down a lot from UPS system. May need spares
- Scrubber flow issues: Float for flow meter, (Update Sourced a flow level indicator install a ball lever) check flow, this is being done regularly and grab sample taken to verify we will meet the ELV if burning solvents at a future date) support plate on order (Will be installed during the shutdown) scrubber drained down monthly. Scrubber scheduled to be drained down, cleaned during May Bank Holiday and routine put into Pemac for this to be done quarterly - completed. Support plate replaced
- Seals fixed on Cooling tower pumps
- Develop list for after long downtimes to ensure valve sequence is correct prior to start up
- Replaced O2 analyser, caustic pump and heat exchanger

For 2007 the Thermal oxidizer runtime was 98.94 % with 129 bypasses, with 86.48 hrs of unscheduled downtime. In 2008, the runtime was 97.97% and 106 bypasses, and 166.88 hrs unscheduled downtime.
In 2009 the runtime was 99.09%, 81 bypasses and 74.22 hrs unscheduled downtime.

The company‘s goal was to continue to improve on this for 2009. This was achieved. This goal will continue for 2010.

Goal No	Target	Status	Completion date	Responsibility
2.9	Elimination of carcinogens usage	Ongoing	Ongoing	Process Technology Group/ Environmental Health and Safety Manager.

Objectives:
To ensure processes are investigated to use non-carcinogenic materials
To eliminate the possibility of the use of carcinogens.
To evaluate and improve present operations with a view to reduction and elimination of carcinogens.

Details:
Sigma Aldrich Ireland Ltd, in the market as a contract manufacturer will change significantly, the production schedules from year to year. The company strives to design products and processes that protect health and safety, prevent pollution, conserve resources and energy, minimize the use of hazardous materials and reduce waste.

Any new processes that are developed on site will be evaluated to try to eliminate the use of carcinogens. A significant amount of work was completed by the PTG Group. A full report is included in the attachment section of the AER.

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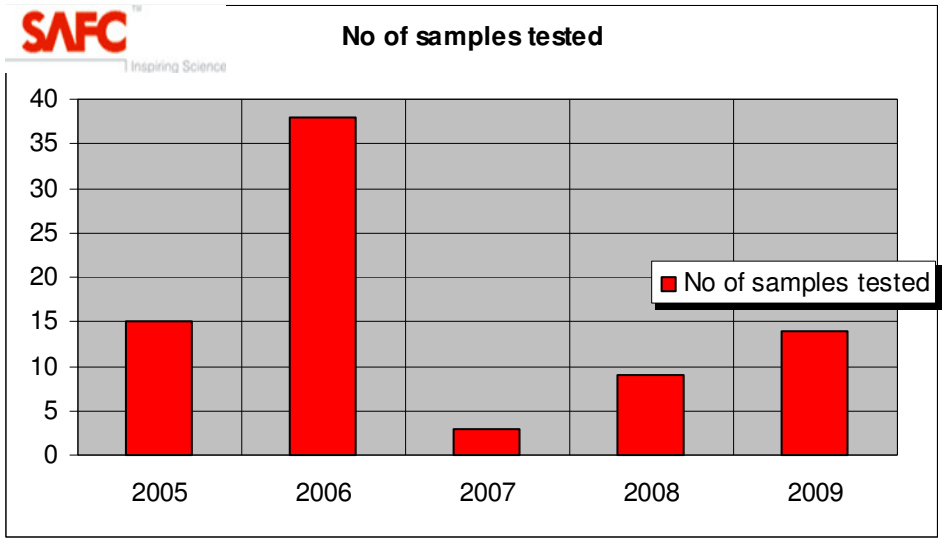
Goal No	Target	Status	Completion date	Responsibility
2.14	Establish toxicity programme for all main aqueous streams produced on site	Commenced February 99	Ongoing	Environmental Health and Safety Manager

Objectives:
To comply with TU Emission limit value.

Details
Stage 1.
A microdot system was obtained in December 1998 to perform toxicity trials.
Stage 2.
Training in the use of the system was completed by the end of January 1999.
Stage 3.
From February 1999 toxicity monitoring and chemical analysis shall be performed on all main aqueous streams. This is still ongoing. Over 150 samples were tested for toxicity and a full chemical analysis in 2000.The figure for 2001 was approximately 120 samples, in 2002, the figure was 117 samples, and in 2003 this reduced to 21 samples due to the database of information developed over previous years. This increased again to 56 samples for 2004. 15 for 2005 and 38 samples for 2006, 3 for 2007 and 9 for 2008.

The testing will continue, but be prioritized on samples where no information is available or on new aqueous phases prior to release to the Wastewater treatment plant.



Stage 4.
A report on the progress of establishing toxicity and chemical analysis shall be reported to the agency as part of the AER. A report for 2009 in the appendices (section 24) of the AER

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Goal No	Target	Status	Completion date	Responsibility
2.16	Continual improvements in the Environmental Management system	Completed	Aim for completion Q3 , 2010	Environmental Health and Safety Manager/ QA Manager/ Engineering Manager

Objective:
To continually improve the Environmental Management system
To aim to achieve and maintain ISO 14001 certification.
To develop procedures and practices
To obtain recertification to standard in 2010

Details:
As this is a continual process it shall be phased over a five-year period.
The person responsible for this shall be the Environmental, Health and Safety Manager.
The Environmental Management System shall be continually improved on from year to year.

Procedures and practices shall be implemented where identified and necessary training given.
Regular audits shall be carried out to determine the effectiveness of the system.

Internal audit Jan 2009,Management review of EMS 2008 – Feb 2009,Management review of certain elements 3 times in 2009,Environmental Policy Updated- May 2009,Site overview Manual Updated- May 2009,Procedure review Mar 2009, a number of procedures updated in 2009,Gap analysis – recommendations for improvement Aug 2009,Legislation review for 2009 – completed

Procedures EVP 014 Review and reporting on environmental matters, EVP 018 Surface water monitoring and storm water protection, EVP 044 Waste management Procedure,EVP 051 Procedure for dust and noise monitoring, EVP 060 Procedure to identify all legal, regulatory and other requirements ,EVP 061 HSE corrective and preventative action tracking system, EVP 067 Analysis of aqueous effluent, surface water, groundwater and river water,EVP 087 Procedure for operation of Durag DEMS software.All procedures reviewed with Corporate EHS principles implemented where appropriate.

Copy of ISO certifications is included in the Attachments section of the AER

This goal for 2010 is to maintain certification and obtain recertification for next three years.

Goal No	Target	Status	Completion date	Responsibility
2.18	Waste minimisation	Ongoing	Ongoing	Operations and Supply chain Manager.

Objective:

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To eliminate waste at source
Recycle and reuse materials where possible
To reduce volumes of waste disposed of.
Improve recycling programme and aim for 10% improvement on previous year's figures

Details:
Many improvements were made in 2009.

Water reduction programmes, improvement in sludge dewatering and minimisation of surface water on site is ongoing. Effluent is used for the filter press instead of clean water.

The site increased its product output for 2009 while resource consumption reduced.
The site also completed a waste audit of all its operations in 2009.This also served to comply with DGSA requirements.
For 2009, the total amount of waste recovered was equivalent to 2140 tonnes or 93% of total waste generated on site. Process improvements resulted in solvent use avoidance of almost 80,000 litres in 2006 with a cost saving of €45,000.The resource use and energy efficiency awareness was rolled out as part of European Health and Safety week. The site used it as an opportunity to raise awareness in the environmental area.

- **Improved segregation of solvent streams with the aim of recycling / re-use rather than recovery.**

In 2007, 377 tonnes of waste was recycled in this manner. This resulted in a cost saving of €60,000. This represents an overall saving of 31% in waste disposal costs.
In 2009, this figure was reduced by a further 40% on waste disposal costs and 38% on waste volume.
Examples of Resource consumption reduction projects which resulted in annualised savings of > €100K, include the following
Review of nitrogen delivery system and purchase price
Reduction of workwear cleaning costs
Reduction of waste disposal costs and streamline waste management practices on site
Examples include Replacement of disposal overalls with Washable garments to reduce the price by 50%, Using tanks to reduce waste costs so that we can make our waste cost neutral- UK and Ireland Focus magazine , Sept 2009.
Reduced waste drum disposal activities
Reduced solid waste categories
Gas usage- cost reduction in 2009 1,256,628 m^3 was used on site. 690,765 m3 was used at the thermal oxidizer. This accounts for 55% of total gas usage on site. Gas usage increased slightly overall by 1 %, but by 12% in TO usage. 26% Reduction in cost.

Developed and implemented partnership with customer for the re distillation of raw material -reuse of solvent (Acetonitrile) in a pharmaceutical process.

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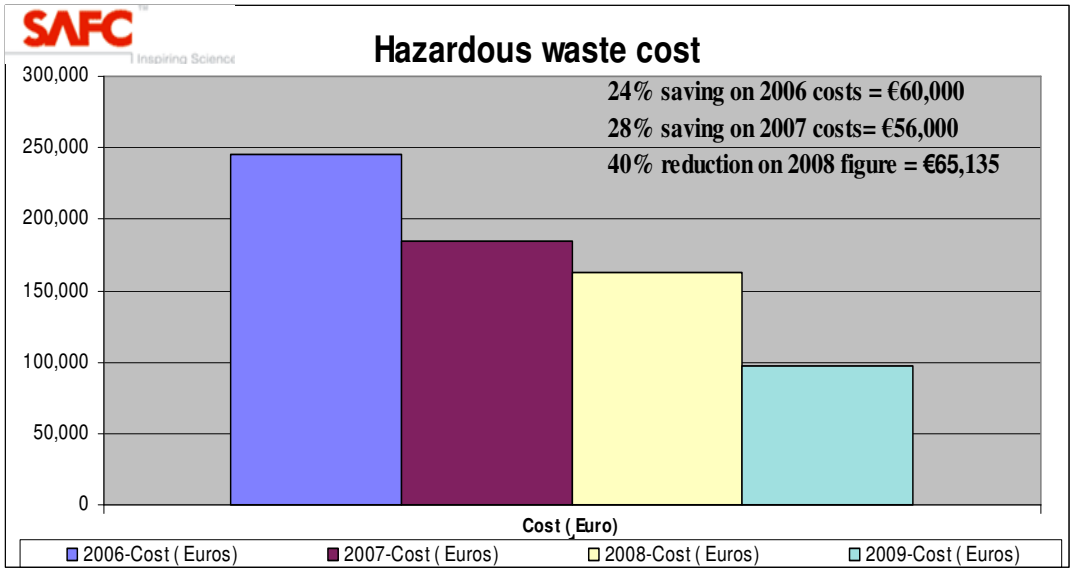

- **Reuse of solvent streams as a fuel substitute.**

License application to include this. The license review application was submitted in September 2006.The final License was issued in July 2009.

- **Continue with the quarterly competitions for energy use reduction, recycling or process improvement programmes.**

Still in progress.

Process improvement projects run in 2009

Dominal base process changed to allow use of recovered solvent. (Toluene)
Removed IPC's from BCH process Beznxy clycloheptanone
Removed acid and water washes from orphenadrine process
Reduced cycle time on doxylamine base and nortriptyline base
Recovered THF for use in MPPC process

The value of these savings comes to €45,000

Further Progress will be reported in the next AER

Goal No	Target	Status	Completion date	Responsibility
2.19	Pollution Emission Register Proposal	Ongoing	Ongoing	Environmental Health and Safety Manager.

Objective:
To ensure comprehensive materials management.

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Details:
In accordance with EPA approval the Company proposed to track emissions of the following compounds over 2008.
A full proposal for 2010 and report for results for 2009 is included in section 9 of the AER.

Goal No	Target	Status	Completion date	Responsibility
2.20	Residuals Management /CRAMP	Completed	Completed, Feb 2010 and reviewed Annually	Environmental Health and Safety Manager.

Objective:
To make provision for the proper closure of the facility ensuring protection for the environment
To decommission, render safe, or remove any matter that may result in environmental pollution.

Details
In accordance with condition 10 of the IPPC licence Register number P-0089-4, the Company has planned to do the following.

Stage 1.
The plan was recently reviewed in July 2008 and subsequently following the change of ownership to Sigma Aldrich Ireland Ltd, in August 2008 and shall continue to be reviewed annually and any amendments and will be notified to the agency as part of the Annual Environmental Report. A copy of the report is in the attachment section of the AER.

Stage 2.
Changes in the following plans shall be implemented following approval from the EPA.

Stage 3.
A final validation report including a certification of completion for the Residuals Management plan/ CRAMP shall be submitted within three months of execution of the plan.

This plan will be reviewed in 2010 to include requirements as specified in the guidance notes issued by the Agency. This was completed in October 2008 and again in Feb 2010 and submitted as part of the AER

Goal No	Target	Status	Completion date	Responsibility
2.21	Environmental Liabilities Risk Assessment.	Completed	Completed June 2008 and reviewed annually	Environmental Health and Safety Manager.

Objective:
To make provision for the proper closure of the facility ensuring protection for the environment

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To provide adequate financing for monitoring and financial provisions for measures to protect the environment

Details
In accordance with condition 12.2 of the IPPC licence, the Company has planned to do the following.

Stages 1 and 2.
The amount of indemnity shall be reviewed annually.

Stage 3.
Written proof of indemnity shall be forwarded to the agency within two weeks of purchase renewal, or revision of the indemnity. This was reviewed and submitted to the agency as part of the transfer of a license application in August 2006. A copy is included in the appendices of the AER.

In Light of the recent amendment to the license, a full independent Environmental Liability risk assessment shall be completed in 2008. This was completed in June 2008 in accordance with the EPA Guidance note; the site was given an overall score of 18 and a risk category of 2. See section 3.5 of the ELRA. Financial provisions were reviewed in section 8 of the ELRA report. This was submitted as part of the quarterly returns in September 2008.

This was reviewed again in Jan 2010, to include comments made by the agency and changes to the site including new warehouse infrastructure. A copy of the ELRA is included in the appendices of the report.

Goal No	Target	Status	Completion date	Responsibility
2.22	Provide improved Environmental training	Completed	Reviewed annually	Environmental Health and Safety Manager.

Objective:
To promote and increase environmental awareness throughout the site.

Details
Areas of environmental training covered in 2009 included the following:
Hours of Environmental, Health and Safety training was provided to staff.

Specific Environmental training to be completed in 2009 include:

- ISO 14001 awareness training for core team and awareness sessions to all site personnel- completed.
- Spill control training- completed.
- Emergency response training- focusing on site wide procedures- completed
- Environmental awareness training- ongoing
- Waste awareness training- ongoing
- Identify critical activities in all departments and implement and execute plan to have full cover in the event of any absences- completed for EHS department

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- WWTP overview- completed
- WATP/ WWTP training - completed
- DGSA (Dangerous goods Safety advisor) course- completed
- Gas cylinder training- completed
- Environmental equipment training – composite sampler/ TOC meter training – completed
- Environmental Induction - ongoing
- Environmental management system awareness training- completed
- Emergency equipment- completed
- Specific on line training in HSE related programmes was completed in 2009.

These were all completed in 2009.

Procedures
Emergency procedure SP-053 signed off and made valid in 04 Feb 2009 and MAPP (Major accident prevention policy) updated June 2009 to include recent recommendations from H.S.A audit Evacuation procedures reviewed and updated. Accounting for personnel – improvements made to existing system
This is an ongoing objective and specific environmental training shall be reported each year.

Goal No	Target	Status	Completion date	Responsibility
2.23	Noise Monitoring Programme	Completed	Annually	Environmental, Health & Safety Manager.

Objective:
To provide for the protection of the environment by control of noise.

Details
A noise survey shall be carried out on all operations annually in accordance with conditions of the Site's revised IPPC licence.

Stage 1.
A noise survey shall be prepared in accordance with conditions of the licence

Stage 2.
A survey programme detailing the timing, nature and extent of the survey shall be sent to the agency. The survey shall include new major items of equipment installed since the IPC licence application. This shall be submitted one month before the survey is to be carried out.

Stage 3.
The monitoring programme shall be carried out and results sent to the agency as part of the Annual Environmental Report.

Stage 4.
Submit results to EPA as part of the AER.

All stages as specified above were completed. A copy of the noise Survey was sent to the agency in December as part of the quarterly monitoring returns, and the site is in compliance with limits

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set out in the license. A summary of the noise report is included in sections 15 and 16 of the AER. The survey shall be similar to that performed in previous years and the proposal is attached in more detail in following sections of the AER.

Goal No	Target	Status	Completion date	Responsibility
2.27	Identify and source outlet for biological sludge	Open	TBC	Environmental, Health & Safety Manager.

Details:

For the foreseeable future, the company shall continue to send sludge offsite for incineration until other disposal options become available.

The company continues to monitor the amount of sludge produced, and the associated dry matter content.

This goal shall be reviewed in 2010, to obtain a more efficient sludge disposal outlet. A report on progress shall be included in the next AER.

Goal No	Target	Status	Completion date	Responsibility
2.31	SBR Pilot data for all main aqueous phases	Ongoing	Annually	Environmental, Health & Safety Manager.

Details:
The company shall conduct pilot trials on all main aqueous phases produced in the plant for 2001. The prioritization of conducting pilot trials will be based on the annual operating plan.

Pilot trials were completed on 15 main aqueous phases, which were produced in the plant in 2001, and 9 aqueous phases in 2002, also 4 in 2003. This increased again to 6 trials in 2004, and 4 in 2005, and 2 in 2006. The SBR pilot data will continue as new aqueous phases are introduced into the plant. There were no new aqueous phases released to the WWTP in 2009.

Goal No	Target	Status	Completion date	Responsibility
2.35	Energy audit	Ongoing	Reviewed annually	EHS Manager.

Details:
The company completed its energy audit from late 2007 to March 2008. A scope of the audit was submitted to the EPA In December 2007. A report on the outcome of the audit was prepared in line with the guidance notes issued by the Agency.

Items for recommendations were added to the register of opportunities, ranked and prioritised based on site resource availability. Progress on completing specific projects will be reported in next year's AER.

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These include the following:

Of the projects completed in 2008, there is an estimated €250,000 annualized saving.

1. Waste Steam Project from T.O. to heat the boiler feed water, on-going, This was completed Mid 2009
2. Leak Survey completed in October on N2, Compressed Air, Breathing Air, Steam.
3. Arising leaks attended to and repaired as much as possible. Good progress noted from previous surveys.
4. Steam Trap survey performed in early 2008. A number of traps were found to be faulty and under performing.
5. 5 x High Efficiency GEM Steam Traps installed in 2008 around the plant in response to Steam trap survey.
6. 2 x GEM Steam traps procured for installation at T.O., to be installed St. Patrick's or Easter weekend.
7. NEW High Efficiency Chiller installed at the back of P3 – replaced P3 chiller.
8. Overhaul of Temperature Control Valves on vessels – better and more refined steam control – annual on-going started 2006, shutdown overhaul.
9. Cleaned Reactor jacket walls – A12 / A13 for better heat transfer in the jackets, ongoing – 2 reactors to be done every year. A10 & A08 to be done in 2008.
10. Clean out Sumps of cooling Towers x 2 annually, improving water quality, removal of deposits and therefore maintaining optimal heat transfer.
11. Combustion Efficiency Testing x 2 annually – adjustments are made as needed to maintain efficiency levels.
12. Boiler Cleanout performed annually – maintains heat transfer at optimum levels.
13. New set of tubes installed in A15 condenser.
14. Further development of Energy Management Programme.

Specific items from the Register of opportunities closed in 2008 I will continue again in 2010.

The focus for 2009
Review Register of opportunities and identify what items can be completed in 2009.
Continue to have energy Team meetings
Complete Energy Awareness sessions in 2009
Close out the following main energy saving projects

Other initiatives for 2009 include:

- Bring about a culture and an awareness of Energy Efficient Practices at Sigma Aldrich,
- Reduce our Energy (Electricity / Gas / Diesel) Costs- **Progress made**
- Reduce Costs to Customer and thereby increase competitiveness- **Progress made**
- Reduce Company's Carbon Emissions (Environmental) **Progress made**
- Promote Environmental Friendly Procedures / Processes at Sigma Aldrich in line with EPA guidelines and Regulatory Requirements- In progress , moving towards a paper free system for recording information
- Make the plant more efficient / economical to operate, **In progress**
- Formalise our Approach through Creation of an Energy Policy - **completed**
- Implement an Energy Management Procedure (Continuous Improvement)- **completed**

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- Energy Management Team - **established**
- Creates a Register of Ideas / Opportunities – **completed**

The two main energy saving projects completed in 2009 included the gas valve head replacement, replacement of boiler burners with energy efficient burners, and the reuse of steam generated at the thermal oxidizer to preheat boiler temperature . Refer to Goal 2.47 for more details

The focus for 2010 is to continue with energy saving initiatives under the register of opportunities

Goal No	Target	Status	Completion date	Responsibility
2.40	IPPC Review of site requirements	Completed	October 2007	Environment, Health and Safety Manager.

Complete License review in line with IPPC directive and BAT (Best available technology) guidance note from EPA. Ensure all information as requested by the EPA for the license application is submitted in a fast and expedient manner. Ensure site is in line with progress for full compliance with Directive from Oct 2007.
The application was submitted by End of September 2006 and the site received its proposed determination in October 2007. Certain conditions of the draft license were appealed by the site. And the final license, taking these items into consideration was issued on 13 December 2007, this was reviewed again in 2008 and final license was issued in July 2009.This in now considered completed.

Goal No	Target	Status	Completion date	Responsibility
2.42	Fuel Substitution Project	Completed	Q3, 2009	Environment Health and Safety Manager.

Ensure that TO fuel substitution condition is included as an option in the revised license for implementation in 2007.

This was incorporated as part of the revision of the site's IPPC License. Some amendments were required for the emission limit value for NOx. This was in progress for 2008 and 2009. The final license was issued in July 2009.

Goal No	Target	Status	Completion date	Responsibility
2.43	Solvent segregation project	Completed	Q1, 2007	Operations Manager

The focus for 2006 is to look at alternative options for solvent re-use. This was achieved but the project will be fully completed by End Q1, 2007

A project currently underway involves methanol recovery, completed which also won the company the Responsible care award with IBEC in the Environment category.

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Responsible Care is an international chemical industry initiative that calls upon companies to show commitment to improving all aspects of performance related to the protection of health, safety and the environment by going above and beyond regulatory obligations.
SAFC's Award is in recognition of the value and benefits delivered by its cross-functional Waste Solvent Recovery Project, launched in 2005. The project's aim was to eliminate/reduce/recover waste streams in all its solvent-using processes.
The Arklow site secured key gains by eliminating overproduction; enhancing stock control; reducing transport of material for re-use; improving inventory management; lowering accident/spill risk and improving processing to intensify re-use.
The Award to SAFC Arklow ltd was presented in Cork, Ireland on September 28, 2006 and was jointly accepted for the company by Project Managers, Tom Ryan Operations and Supply Chain Manager and Dora Forde Environmental Manager.
Improved segregation of solvent streams with the aim of recycling / re-use rather than recovery.

Reuse of solvent streams as a fuel substitute

It is anticipated that the completion of this project will result in cost savings of approximately by € 60,000 in 2006. Final analysis of the waste costs for 2007 show that this was realized. This was followed by € 56,000 in 2008 and a further by € 65,000 in 2009.

Goal No	Target	Status	Completion date	Responsibility
2.44	Efficient Process control	Completed	Q4, 2009	Operations Manager

Objective:
To ensure there are adequate control of processes under all modes of operation
Identify key indicator parameters for process control performance
Identify methods for measuring and controlling these parameters

Details
In accordance with condition 2.2.2.9 of the IPPC licence, the Company has planned to do the following. Efficient Process control process improvement is part of the Productivity projects outlined for 2008.
The focus of this project will be 2 processes in particular, Doxylamine and 4 chloro.
This was successfully completed with the following main changes being implemented.
For the 4 Chloro process the quantity of thionyl chloride used per batch was reduced by 30% which reduced our usage of thionyl chloride by 9,000kg in 2008.

For the doxylamine process we reduced the amount of xylene used per batch by 1,000L. This reduced our usage of xylene by 20,000L last year.
In 2009 the following process improvements were made which resulted in cost savings of €45,000
Dominal base process to allow use of recovered solvent. (Toluene)
Removed Pick's from BCH process (Benzylcycloheptanone)
Removed acid and water washes from Orphenadrine process
Reduced cycle time on Doxylamine base and Nortriptyline base
Recovered THF for use in MPPC process – see below

The process to manufacture MPPC, an intermediate for Doxylamine Succinate requires the use of THF. THF is used to prepare a solution of the raw material 2-BOP

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Typically, 20,000kg of THF are used per yr in this process, for the manufacture of 13T of final product (15 batches) at a cost of 3.65/kg THF the annual spend is thus 73,000 Euro
At the end of this process the THF is removed by distillation, however the distilled THF is not suitable for direct reuse in subsequent batches as it is contaminated with water. The MPPC process also contains THF from a second process input (Methyl Magnesium Chloride in THF), thus the volume of THF removed from the process at the end is significantly larger than that required for the 2-BOP/THF solution requirements
A legacy plant process was available for purification of this THF, however the process had issues in the areas of resource consumption (high reactor utilisation & labour intensive) and also had some safety issues (hot concentrated caustic). For these reasons it had not been possible to recover THF for reuse.
A new process has been developed to reduce the reactor utilisation to 50% of the previous process, simplify the labour aspects & remove the hot concentrated caustic from the process
Plant introduction was initiated in Dec 2009, and continued into 2010
This recycling process has the potential to provide all of the THF required for the preparation of 2-BOP/THF solution as the output stream of THF from the MPPC process also contains THF resulting from the input of Methyl Magnesium Chloride in THF.
The variable costs associated with recycling the THF are small, the only materials required being caustic (both solid & liquid). Per batch use 350kg solid @ 1 euro/kg = 350 euro and 650 L liquid @0.3/litre = 195 Euro. Total raws costs per batch of rec THF 545 Euro, thus 8175 Euro for 15 batches
Value of 15 batches recovered THF 73,000 Euro. Raws cost 8175 Euro. Thus variable contribution approx 60k per yr over full year.

The site will continue with process improvements on a number of selected processes for 2010.

A report of improvements made will be reported in the next Annual Environmental Report.

Goal No	Target	Status	Completion date	Responsibility
2.45	Pipe, valve and gauge review.	Completed	Q4, 2008	Engineering Manager

Objective:
To ensure there are adequate control of processes under all modes of operation

Details:
In accordance with 3.6.4 of the IPPC License, the company has planned to do the following:-
Verify that all inlets, outlets, vent pipe and valves and gauges are within bunded areas of all solvent tanks.
The existing tank register shall be updated to reflect this assessment and any recommendations for improvement shall be completed within the timeframe.

This was completed in August 2008. This is considered completed, however will be reviewed again in 2011

Goal No	Target	Status	Completion date	Responsibility
2.46	Thermal oxidizer efficiency	Completed	Q4, 2009	Engineering Manager

Objective:
To assess the heat recovery from the thermal oxidizer (€50,000)
Cost feasibility study of fuel substitution

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The site plans to install a system to reuse steam from the thermal oxidizer system to preheat air in the boilers. This will save on gas usage and improve energy efficiency in the thermal oxidizer system. Design has been finalised on steam recovery/VSD burners. Estimate completion around Nov 2009. This was completed a summary of each project is outlined below

WATP Steam Recovery Project Summary

SAFC Arklow investigated the potential around utilising / recovering the heat from the thermal Oxidiser low pressure steam, which was dumped in its entirety. The
Most cost effective option unearthed has been that of using this low pressure steam to preheat the boiler feed water to the two main plant steam (high pressure) boilers.

Based upon a continuous estimated steam consumption rate in the plant of 3500 kg/hr, and a cost of heating this from 90C to 200C of €23/hour, and 5.5 day week operations, the calculated annual saving is of the order of €135,000, versus an implementation cost of approximately €95k. Thus the payback is about 8.5 months. Should the
Plant operate 24/7, the annual savings will obviously increase.

Boiler Combustion Efficiency Project Summary

The purpose of this project was to further enhance energy efficiency, by minimising boiler inputs using best available techniques and technologies. The project consisted of replacing combustion burners with a more efficient type, including VSD, to optimize combustion efficiency. The boiler control system was also replaced and replaced with modern unit.

Expected results are a reduction in gas consumption of 3%, electrical consumption reduction of 25%, reduction in thermal radiation losses, reduction in water consumption and cost, and consequently, a reduction in boiler emissions.

The site will revisit the feasibility of fuel substitution. The scope of which shall be the following:-

- Review study completed in 2005 in light of the revised license
- Changes in waste disposal,
- Anticipated waste streams
- Current site energy demand
- Additional capital and operational costs associated with burning waste solvents.(Continuous particulate analyzer, reprogramming data logger),
- Revision of CEM measurement ranges in line with ISEN 14181
- Cost of test programme and CEM calibration to ISEN 14181
- Ongoing monitoring and reporting costs for TO operations
- Review of existing solvent delivery system
- Review of solvent specification, gas and fossil fuel usage for TO and site boilers
- Review of short and medium production plans
- Current and future projected waste disposal costs plus analysis of waste solvent
- Operational costs.
- Options appraisal comparing capital and operational costs
- Schedule time frame for implementation

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This report was completed by external consultant in 2008. The Final report was issued in August 2008. The recommendations for implementation of the fuel substitution will be considered for Capital approval in 2009, with a view to implementation in 2010. This was re visited in 2009 the fuel substitution aspects of this project will be revisited next year, however the report on the CEM calibration with ISEN 14181 was completed. In summary the findings are as follows

CEM calibration to ISEN 14181

The results from the statistical analysis on a limited dataset in accordance with the requirements of I.S. EN 14181 show that CO, SO2, NOx and TOC measured pass the variability tests. The AMS also, gives a good correlation and is acceptable for the purposes of meeting IS14181 (all R2 were all between to 0.9 and 1) and a good calibration range according to EN14181 for CO, NOx (expressed as NO2) and TOC measurements. However, the calibration ranges for SO2 indicates that it is below the emission limit values set in the sites IPPC licence. However, in accordance with IS EN14181 for measurements above the calibration range, the calibration curve has been extrapolated in order to determine the concentration value.

The AMS was subsequently re-calibrated by GM environmental on the 9 Nov 2010 to eliminate bias with the AMS readings. In obtaining span gas data for this validation study, URS has taken the re-calibrated values as the AMS span test readings to ensure the statistical analysis is based on the current AMS readings. We had previously used the non-calibrated data contained in the GM environmental on the 9 Nov 2010. HCl span gas data from the GM Environmental reports have been included in this assessment, and the results taken through the statistical analysis.
However, in considering both SRM and GM environmental data for HCl, URS has concluded that the test readings obtained for HCl demonstrate that the AMS was reading higher than the actual results – slight positive bias. Also, the SRM test data shows that for normal operation when burning natural gas as an auxiliary fuel very low to negligible concentrations would be expected well below the ELV of 60mg/Nm3.

A copy of this report Ref DULT0001:49341802 is in the attachments of the AER.

Goal No	Target	Status	Completion date	Responsibility
2.47	Efficiency of Septic tank	Completed	16 December 2009	Environmental Health and Safety Manager

Objective:
To assess the efficiency of the septic tank system
To investigate opportunities for further improvement

Details:
The site will complete an assessment of the operation of the system for the treatment of sanitary effluent
This will include recommendations regarding the upgrade of the system where necessary
The report will address the design capacity of the current system with current and projected loading
The efficiency of the system will be assessed, with comparisons to of Waste water treatment systems. The site will have regard to wastewater treatment manuals published by the EPA.
This assessment was undertaken in September with the final report issued in November 2008. It was also submitted to the EPA as part of the quarterly monitoring returns in December 2008.

Apply for Planning Permission, August 2009.
Use Site Suitability Report from Dr. Bolton as well as his report on assessment of septic tank system at SAFC to decide what options was available and which locations were suitable for development.

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- Put together project scope document based on Dr. Bolton's reports and put project out to tender, tender date: September 2009.
- Award the Project to BAM Building Ltd., award date: Week 3 October.
- Receive Notification from WCC of the decision to Grant, date: 09 October 2009
Submit security of €1000 in compliance with condition 6 of grant of planning permission, November 2009. See confirmation letter below of compliance to condition no. 6.
- Submit Commencement Notice form to Wicklow County Council and display on site, 02 December 2009 - Commencement date to be 19 December.
- Test the receiving soil (percolation t-tests) in the proposed location for soil polishing filter, in order to satisfy condition no. 3 of planning permission.
- Submit letter + report from Environmental consultant (Dr. Bolton) to WCC in compliance with condition no. 3 of PP.
- Source suitably permeable soil for import for the soil polishing filter (test the permeability of soil at source through t-testing) - For Condition No. 5 of PP.

Commence Excavation & Construction Work

- Excavate for and install the 3 tank treatment system incl. control panel (Location shown in drawing attached)
- Set up a maintenance service contract with treatment system vendors - Molloy Precast (see attached) - Satisfies Condition No. 4 of Planning Permission.

- Excavate for and install new foul water pipeline (Leave tie-in to existing lines until last)
- Excavate for the soil polishing filter (Location shown in attachment above)
- Import and Install the polishing filter soil layer by layer (as per EPA guidelines and conditions of PP)
- Test and record the permeability of each imported layer of the polishing filter soil (as per EPA guidelines and conditions of PP)
- Ensure that the permeability test results for each test meet the specified criteria (as per EPA guidelines)
- Install distribution network of pipes on top of the polishing filter area (as per EPA guidelines)
- Submit report on the suitability and permeability results for the receiving soil and the imported polishing filter soil to WCC for approval of compliance to condition no. 5.

- Install layers of gravel on top of distribution pipe work (as per guidelines)
- Leave a hole in the ground underneath one of the hole in the distribution pipe work - as a sample point for testing effluent
- Excavate for new underground PVC pipe work to tie into old foul lines and join in to the new treatment system, and bypassing the existing septic tank system. See attached site plan drawing above.
- Install new underground PVC pipe work but do not yet break into existing lines. (Old system is still in place at this stage)
- Cease usage of toilet facilities (weekend) stopper foul pipelines upstream of the required tie-in points. Empty and clean down the existing septic tank system and associated adjacent pipe work.
- Break into old underground pipe work / manhole system and connect the old pipe work into the newly installed pipe work system to the new treatment system.
- De-Commission the old septic tank system.
- Take out stopper from upstream of tie-in points and start to use newly installed effluent treatment system.

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Goal No	Target	Status	Completion date	Responsibility
2.48	Fugitive emissions	Open	Reviewed annually	Environmental Health and Safety Manager

Objective:
To identify and assess the current status of fugitive emissions to atmosphere
To quantify the extent of fugitive emissions
To review previous fugitive emission study (March 2006)
To identify reduction strategy
To implement recommendations

Details:
All sources of fugitive emissions will be identified.
A quantitative assessment will be completed to measure the extent of fugitive emissions
Identify methods to reduce fugitive emissions
Examine the need for a catchment system to collect any leaks from flanges and valves. This will be completed by reviewing the flange and valve leak inspection programme, and spill control programme.
Prepare list of recommendations
Implement recommendations
Due to the extent and nature of all the environmental projects, in progress at this time, and given that the most recent fugitive emissions study review dated March 2006, this shall be reviewed in 2010, following completion of the more significant environmental projects.

Goal No	Target	Status	Completion date	Responsibility
2.49	WWTP performance	Open	Reviewed annually	Environmental, Health and Safety Manager

Objective: To assess the performance of the WWTP.

Details:
The company will report on % removal rates for N, P, COD and BOD.
This is included in section 12 of the Annual Environmental Report and will continue to be reported annually as part of the AER.

Goal No	Target	Status	Completion date	Responsibility
2.50	Groundwater monitoring review	Completed	Feb 2010	Environmental, Health and Safety Manager

Objective: To assess the existing groundwater quality database.

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Details:
The company will review the following:-
Highlight contaminant levels on site
Assess the effectiveness of the current groundwater monitoring strategy and current monitoring natural attenuation programme.
Review existing soil sampling data.
Update conceptual site model.

A report will be submitted to the Agency following completion of the study.
This report was completed by external consultants by May 2008. The report reviewed the previous 4 years data, since the last independent groundwater review. The report concluded the following:

The current MNA strategy, together with the ongoing programme of environmental improvements at the site, has been effective in the continued reduction of organic contaminant impact on groundwater at the site in 2007.
The analytical results for 2007 furthermore indicate that the biological and ecological quality of the Avoca River is not affected by the localised groundwater contamination detected at the site.
Referring to the corrective actions in the EPA Audit letter to Sigma Aldrich Ireland Ltd, dated 28 January 2008, the evidence from the monitoring programme indicates that the contaminant plume is shrinking and that MNA strategy adopted at the site is effective.

A Full groundwater review was repeated again and was completed from Nov 2009 to February 2010. Report Ref "Issue No 2, 49341802/CKRP0001". The purpose of this review was to:

Review groundwater results up to end of 2009 with an interpretation of the results to date and to the viability and duration of the Monitored Natural Attenuation Strategy.

The review updated the existing groundwater quality database, with recent monitoring data collected by Sigma Aldrich up to the end of 2009. Refer to report Ref Issue No 2, 49341802 / CKRP0001

Review the database, highlighting trends in groundwater quality and key contaminant distributions Compare groundwater results against EPA interim guideline values, highlighting excedences where present and Review the active processes and effectiveness of the current MNA strategy and likely duration of the MNA Strategy.

This report concluded that VOC concentrations in groundwater and surface water have generally continued to decline in groundwater from across the site, indicating that the MNA strategy adopted continues to be effective. A copy is included in the attachments section of the AER.

Goal No	Target	Status	Completion date	Responsibility
2.51	Emergency procedures	Completed	30 December, 2009	Environmental Health and Safety Manager

Objective: To ensure procedures are current and reflect current site practice.
Details:

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The Major accident prevention policy shall be reviewed to ensure that it reflect current site practice.
The Emergency Response procedures shall be reviewed to ensure they are up to date
Complete training on emergency equipment, SCBA and chemical spill training, Complete training scenarios, complete drills with external emergency services.
In 2008 and 2009:
ERT drill was completed Oct 2008, debriefs, and notes on file. Corrective actions for improvement in progress.
Emergency procedure SP-053 and MAPP (Major accident prevention policy) updated June 2009
Evacuation procedures reviewed and updated. Accounting for personnel – improvements made to existing system. Copies of all plans submitted to local authority for inclusion in county development plan.

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8.0 Schedule of Environmental Objectives and targets for 2010.

Given the large Number of target, the company will continue to focus on the above goals and targets for 2010

Specific items to be addressed in the Environmental Management Programme 2009		
Target	**Goal Number**	**Target Date**
Track Thermal oxidizer performance. Improve thermal oxidizer "Uptime" and reduce number of bypasses by 50%	2.1	Ongoing
Conduct a study to assess the elimination of carcinogens usage.	2.9	Ongoing
Establish Toxicity testing programme for all main aqueous streams produced on site Pilot trials on High BOD streams in conjunction with Toxicity	2.14	Ongoing
Continual improvement in the Environmental Management system Maintain ISO Certification	2.16	Ongoing
Maintenance and calibration of all new equipment	2.17	Ongoing
Waste minimization Improve recycling programme and aim for 10% improvement on previous years figures	2.18	Ongoing
Pollution Emission Register (PRTR)	2.19	Ongoing
Residuals Management/ CRAMP (10.2)	2.20	Reviewed annually
Environmental Liabilities (12.2.1)	2.21	Reviewed annually
Provide improved Environmental training	2.22	Reviewed annually
Noise	2.23	Repeated annually
Identify and source outlet for Biological sludge	2.27	Reviewed annually
SBR Pilot data for all main aqueous phases	2.31	Reviewed annually
Energy efficiency	2.35	Reviewed annually
Fuel substitution project	2.42	Completed
Solvent segregation project	2.43	Reviewed annually
Efficient Process control (2.2.2.9)	2.44	Reviewed annually
Pipe valve and gauge review (3.6.4)	2.45	Completed
Heat recovery from Thermal oxidizer and efficiency (3.15) Cost feasibility study of fuel substitution	2.46	Completed
Programme for the identification and reduction of fugitive emissions (6.9) Examine the need for a catchment system to collect any leaks from flanges and valves review(3.10)	2.48	Reviewed annually
Assessment of performance of on site WWTP (6.12)	2.49	Annually
Annual review of Accident prevention procedure and emergency response procedures (9.1)	2.51	Annually

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9 PER report 2009 and PER proposal 2010

In accordance with condition 2.4 of the Integrated Pollution Control License Register no P 0089-3 the following is Sigma Aldrich's proposed programme for a Pollution Emission Register (PER).

Considerations

The following factors were taken into account when outlining the Company's Proposal, for the Pollution Emission Register (PER).

- Sigma Aldrich Ireland Ltd produces a wide variety of different finished products and intermediaries with a broad range of applications and usage.
- Quantities of material used per year
- Use of Materials
- Production Schedule for the year as far as is practicable
- Monitoring requirements / Instrumentation

Sigma Aldrich Ireland Ltd proposes to incorporate the following substances in the PER,
Having reviewed the Requirements of the E-PRTR Regulation (EC) No 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register and The PRTR Regulations are the European Communities (European Pollutant Release and Transfer Register) Regulation 2007, S.I. No. 123 of 2007), which signed into Irish Law on 22March 2007 the E-PRTR Regulation, The national obligations (EC) No 166/2006, concerning the establishment of European Pollutant Release and Transfer Register amending Council Directives 91/69/EEC and 91/61/EC.

RAW MATERIALS LISTED SPECIFICALLY ON PERL

As substantial quantities of these materials specifically listed are used on site and vary considerably from year to year, they will be included in the PER on a priority basis over the following 5 years following a review annually with the Agency.

SUBSTANCES FOR INCLUSION IN THE PER/PRTR

We can confirm licensed emissions that will be reviewed and reported under the new web based system if thresholds for releases have been exceeded. We have stated below which substances listed under Annex II of the PRTR Regulation apply to the facility.

Cas Number	Pollutant	Comments
74-82-8	Methane	**Generated on site from process MPPC and DECC**
630-08-0	Carbon monoxide	**Air emissions**
124-38-9	Carbon Dioxide	**Air emissions**
10024-97-2	Nitrous oxide(N20)	**Expressed as NO2**
7664-41-7	Ammonia	
	Nitrogen oxides(NOx/NO2)	**Expressed as NO2**
	Sulphur oxides (SOX/SO2	**Expressed as SO2**
	Total Nitrogen	**Stored on site**
	Total Phosphorus	**Phosphoric acid for use at WWTP**
75-09-2	Dichloromethane(DCM)	
	PCDD + PCDF(Dioxins and furans) as TEQ (10)	

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71-43-2	Benzene	**Totally consumed in reaction**
108-95-2	Phenols	
108-88-3	Toluene	
	Total Organic carbon (TOC) (as total C or COD/3	**Effluent emission**
1330-20-7	Xylene	
	Chlorides (as Total cl)	**Effluent emission**

Note: 2- Chlorotoluene and Benzyl Chloride are compounds specifically used as reactants and are consumed in the reaction.

The Pollution Emission Register shall be revised annually as part of the Annual Environmental Report.

Proposed Methodology

The methodology to be used in determination of material destinations is outlined in detail below. The reporting form included in Appendix 3.9(b) of the PER section of the guidance note for the Annual Environmental report shall be completed.

1. Records of incoming materials for the year shall be kept. The total quantity of purchases will be added to the opening stock figure and the closing stock figure **(x^1),** shall be subtracted to give the total quantity of incoming material **(X)** used

2. Opening stock of recovered substance minus the closing stock of recovered substance **(y^1)** shall give the total amount of recovered substance used for the year **(Y).**

3. The total usage of substance is **(X+Y)**

4. Quantities taken off-site for Disposal by incineration / Recovery or otherwise shall also be recorded. A sample of each shipment shall be taken and analysed for the above components.

5. Regular analysis of both the influent and effluent from the wastewater treatment plant shall be performed on a monthly basis to quantify the amount of substance in this medium.

6. The sum of material taken off site in addition to the quantity of material calculated as present in to the wastewater treatment plant shall be subtracted from the total usage of material to quantify the losses to Atmosphere.

7. The losses to atmosphere shall also be calculated by direct measurement based on the emissions from header system. Some fugitive emission monitoring may also be carried out.

***Losses to Atmosphere = Usage* (X+Y) *- (Quantity taken offsite + Quantity calculated in + Material unaccounted for the wastewater treatment plant) - current stock* (x^1 +y^1).**

PER results for 2009

In accordance with EPA approval the Company tracked emissions of the following compounds over 2009

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Tonnes	Usage	Off site	WWTP	Atmosphere	Calculated fugitive losses
Total nitrogen	218.329	0	3.07	2.649	0
Dichloromethane (DCM)	0	0	0	0	0
Toluene	182.771	148.9974	0	0	0
Xylene	70.981	73.957	0	0	0
Ferrous Sulphate	0	0	0	0	0
2-Chlorotoluene	6.091	0	0	0	0
Methybromide (bromomethane)	0	0	0	0	0
Phosphoric acid Total phosphorus	0	0	0.0604	0	0
PCDD + PCDF (dioxins + furans) (as Teq)	0		0	3.67E-07	0
Benzene	0	0	0	0	0
Phenols (as total C)	0	0	0	0	0
Total organic carbon (TOC) (as total C or COD/3)	0	0	13.76	0.1355	0.0602
Chlorides (as total Cl)	0	0	1522	0	0
Benzyl chloride (Alpha-chlorotoluene)	4.998	0	0	0	0
Chlorotoluene	6.091		0	0	0
Acetone	134804	49795	0	0	0
Ammonia 25%	0		0		0
Ammonia 30%	0	0	0.7194	0	0
Dimethylamine	0	0	0	0	0
Ethyl acetate	6130	0	0	0	0
2 b ethanol	0	0	0	0	0
Heptanes	0	0	0	0	0
IMS	0	0	0	0	0
Isopropanol	303.113	143.649	0	0	0
Methanol	93.269	30.4186	0	0	0
Methyl chloride	0	0	0	0	0
MEK	4.948	50.074	0	0	0
MTBE	0	1.8096	0	0	0
n-Hexane	4.629	3.469	0	0	0
n-Propanol	55.292	20.066	0	0	0
THF	67.838	66.977	0	0	0.032
Copper II Chloride	0	0	0	0	0

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Discussion of results for 2009

The solvents represented almost 100% of all solvents used on site, and almost 100% of all solvent waste sent offsite. 963 Tonnes of solvent was purchased in 2009, 934 T was used, 915 T was sent for recovery offsite.

One of the recommendations from the fugitive emission study completed in 2006 was to perform more analysis on the influent as it entered the waste water treatment plant. This recommendation was implemented since2008.

Limitations to sampling, analytical techniques etc will be overcome somewhat, through the implementation of the solvent segregation project. This will enable more accurate results while testing tank contents, with less probability of other solvents being present.

For calculated fugitive losses, Refer to Assessment of Water 9 model for WWTP fugitive emissions Dated Mar 08, 2006 from URS Dames & Moore, Issue no 45078504.This has been included in the EMP for 2008.

There was no DCM purchased or used in 2009.

Waste solvent emissions for off site are calculated by multiplying the % per load by actual tonnage (from certs received and dividing by 100. The waste % figures are obtained from the Hazardous waste database.

MTBE usage was 0 Tonnes, 1.8096 tonnes is calculated as gone off site as per waste shipments, 0% was detected in WWTP samples; the difference may be attributable to some waste already in tanks at the beginning of the year. There may be some losses to atmosphere but this is calculated as Total VOC. The same issue arises with MEK, Xylene.

Methanol is recycled a number of times on site prior to being released off site for disposal. Other uses of methanol are cleaning 2000 L /week, fridges, and mother liquor from SMB released to WWTP etc

PCDD's and PCDF's were only measured on air emissions main vent point not enough data to estimate accurately, emissions to waters. Dioxins measured 4 samples over year, multiplied by actual flow, averaged for the year and then multiplied by the average flow for the year to get the mass emission for the year. Results are expressed as TEQ. For dust it is average of the samples taken for the year, multiplied by the actual flow for the year

Confirmed Benzene, Ferrous Sulphate, Dimethylamine was not used for 2009.

2 Chlorotoluene, and Benzyl chloride were not detected in WWTP or emissions to air, both are raw materials that are consumed in the reaction. 2 Chlorotoluene was used in 2009

Total Nitrogen is the amount of nitrogen bought in on site. NOX is the amount of N emissions from A1-7. Total Nitrogen for emissions to water is total Kjeldahl Nitrogen.

CO, NOX and SOX obtained from EPA Air total 2009 file. These figures are actual Kgs measured by online measurement at TO in mg/m3 multiplied by actual flow, each month.

TOC is calculated as actual COD /3 for emissions to water is 47.18tonnes / 3 and NMVOC for emissions to air i.e. 60.2 Kg while in bypass and 13.55 kg while TO be in operation.

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11 Emissions to Atmosphere Summary

11.1 Summary Information

The % compliance is determined for parameters that were outside the specified limit. This was the number of compliant samples divided by the number of samples per year. A summary of the overall compliance rate for air emissions:
In 2000 was 71%,
In 2001 was 85%,
In 2002 was 82.14%.
In 2003 was 100%
In 2004 was 99.999%
In 2005 was 100%
In 2006 was 100%
In 2007 was 99.999%
In 2008 was 99.999%
In 2009 was 99.999%
In May 2003, the thermal oxidizer was officially commissioned and emissions were subsequently monitored from the thermal oxidizer vent. The vent no Ve P1-P3 was therefore made redundant.

Boiler monitoring was carried out by external consultants in accordance with license requirements. This was completed in December 2009.
Mass emissions for year were calculated using the reporting format for the continuous emission monitoring system. All parameters complied with condition 3.1.1 (ii) of the company's license and were in excess of 99.9%. A summary of annual emissions is in the attachments section of the AER.

The number of samples calculated is the total downtime including scheduled downtime subtracted from total days (343) in year multiplied by 48 samples per day. CO2 is expressed as CO2 equivalent.

Dioxins were measured quarterly for the first year of operation. This officially started in May 2003 and is currently monitored annually. Dioxin samples were taken in March 2009.

The bypasses are reported under section 13- reported incidents summary. TOC (Total organic Carbon) is calculated during these bypasses at 60.16kg /year which is a 33.5% improvement on previous year's figures.

Parameter	Number of samples	No of breaches	Tonnes to atmosphere 2007	Tonnes to atmosphere 2008	Tonnes to atmosphere 2009	% Compliance 2009
T.A. Luft Organics	0	0	0	0	0	100%
HCl	16464	0	0.0022	0	0	100%
SO_2	16464	0				100%
SOx	16464	0	0.0074	0.0215	0.0416	100%
CO	16464	0	0.0834	0.0945	0.0784	100%
Dust	8	0	0.02	0.119	0.0012	100%
NO_x	16464	0	2.3638	2.4273	2.649	100%
TOC	16464	2	0.255	0.0905	0.062	99.9987%
Dioxins	2	0	1.926E-07	4.14169E-07	3.67E-07	100%

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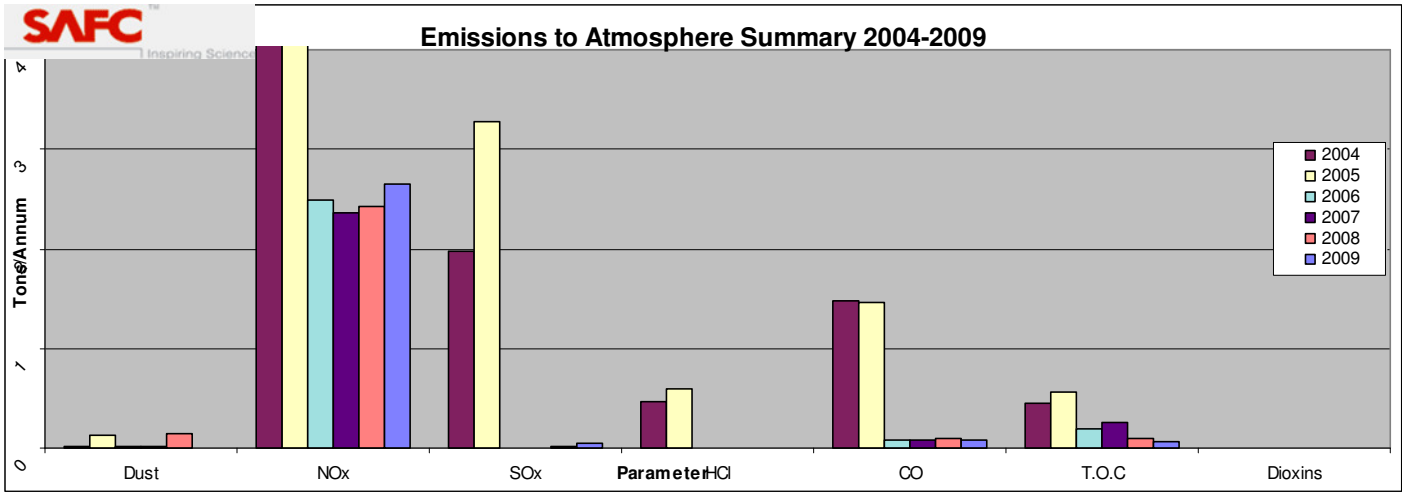
Details of non-compliance

Date	Parameter	Emission point reference Number	Cause	Corrective action
14 Jan 2009	TOC breach of ELV 27.8 Vs 20.0 mg/m3	A1-7	2 exceedences of TOC ELV for CEMS	Checked processes going on in production at the time. Error was detected immediately. Called Environmental Manager, Checked calibration of unit, Fault with Fidamat unit itself to be further diagnosed with External services company contacted to verify /diagnose fault. This was completed by 15 Jan 2009 Damage due
22 Feb 2009	TOC air emissions Breach,	A1-7	Caused by blocked filters. There was No Production	Full service completed

Note: There was No notification of non-compliance received in 2009, with regard to air emissions.

Trend analysis



11.2 Dust Emissions Summary

The frequency is annually for all emission points except for vent Ve A1-7 which is required quarterly. Therefore additional dust monitoring was performed for this point The licensed emission limit value for dust is 1.0 mg/m^3 at mass flows greater than 1 g/hr and for pharmaceutical dust is 0.15 mg/m^3 for all emission points except for Vent No A1-7 where the mass emission limit value is 30 mg/m^3. The results demonstrate that no particulate matter was detected from any emission point monitored, at concentrations greater than each sampling run method limit of detection. Consequently, all mass emissions of total particulate matter determined for all vents monitored were below 1 g/hr.

A trend above shows a summary of emissions for 2009.

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Note: Mass emissions cannot be determined for vents 192, A1 and A2 as they are not running continuously, and depend on production schedules.

The estimated mass emission from Vent No A1-7 for dust is 23.427 kg for the year 2006, 18.62 Kg for 2007, and139 kg for 2008 and 1.2 kg for 2009. This equates to an average of 7.768 mg/N m^3 for 2009 and the limit is 30 mg/ Nm3.

11.3 Fugitive Emissions Summary.

TOC (Total Organic Carbon) was calculated at 197 kg for 2006, 255 kg for 2007, 90.50 kg for 2008, and 60.16 kg for 2009.This is a 33.5% further improvement in 2009

The total mass emission during bypasses for 2003 since the start of operation of the thermal oxidizer since May 2003 is equivalent to 483.385 kg of TOC, 456.40 kg of TOC for 2004 and 555.28 kg for 2005 and 197.34 kilos for 2006. And 255 kilos for 2007, and 90.5 kg for 2008 and 60 kg for 2009. These emissions are categorized as fugitive emission losses and would represent less than 90.5 /919,953kg (0.0001%) (Based on survey completed in Late 2005) represents less than 0.026% of the sites fugitive emissions. This would increase the fugitive emission losses from 0.76% to 0.78 % which is low and an order of magnitude lower than the solvent regulations fugitive emission value of 15%.

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12 Emissions to Water Summary

12.1 Summary Information

This data is based on daily monitoring of all parameters except metals which were done quarterly. The average Kgs/day is calculated based on daily concentration emission limits multiplied by the average flow. The mass emission for 2009 is expressed in tonnes per year calculated by taking the average mass emission per day and multiplied by the number of days the plant was in operation.

The % compliance is determined for each effluent parameter.
This was the number of compliant samples divided by the number of samples per year.
The company was 99.99% compliant for all effluent samples taken and analyzed for 2009.

Parameter	Mass Emission (Average kg/d) 2008	Mass Emission (Tonnes) 2008	Mass Emission (Average kg/d) 2009	Mass Emission (Tonnes) 2009	% Compliance 2009
Average Flow m^3/d	89.73		82.75		100
Temperature	18		17		100
PH	7.53		7.61		100
COD	129.60	47.18	113.43	41.288	100
BOD	23.84	8.67	16.128	5.871	100
Suspended Solids	26.86	9.78	19.486	7.093	99.45
Total dissolved solids	65.1	23.70	102.57	37.337	100
Total Nitrogen (Kjeldahl)	8.10	2.95	8.44	3.070	100
Nitrates (as N)	0.28	0.10	0.0716	0.03	100
Ammonia (as N)	1.86	0.68	1.98	0.7194	100
Total Phosphorus (As P)	0.15	0.06	0.1658	0.06	100
Sulphates as (SO_4)	55.60	20.24	229.16	83.413	100
Chlorides	192.80	70.18	4.183	1.522	100
Lithium	1.6929	0.6162	0.028	0.01	100
Sodium	112.97	41.12	1.2522	0.46	100
Potassium	21.48	7.82	11.310	4.12	100
Magnesium	4.40	1.60	10.430	3.797	100

Details of non-compliance

Date	Non- Compliance	Cause	Corrective action
10 Jan 2009	Suspended Solids 206 kg Vs 60 kg/day	W1	Low levels in final effluent buffer tank following Christmas shutdown
03 Feb 2009	Suspended solids breach 99.184 kg Vs 60 Kgs	W1	Elevated levels of solids in SBR due to cold weather <-2 C. This affected settle ability of effluent
04 June 2009	Leak in WWTP caustic bund	W1	Actuator valve closed, Caustic pumped into cubes, Pumps to balance tank turned off, Seg and emergency tank pH were high Cordon off area to prevent access Surface water tag log showed elevated levels of pH, which caused the diversion valve to activate; there was no impact on the river. Checked surface water, cleared line and recalibrated pH probe. Reset CV6501 and 6502 to read 1 for open and 0 for closed.

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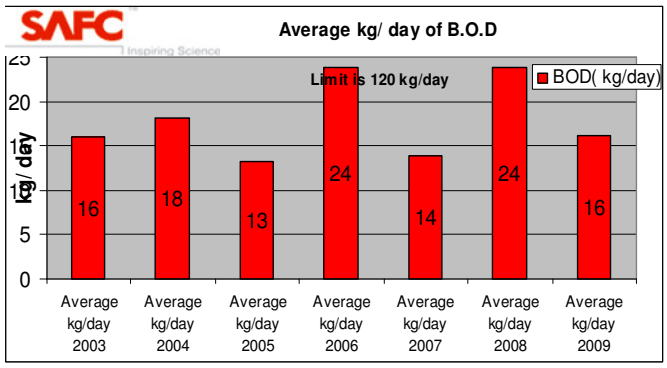
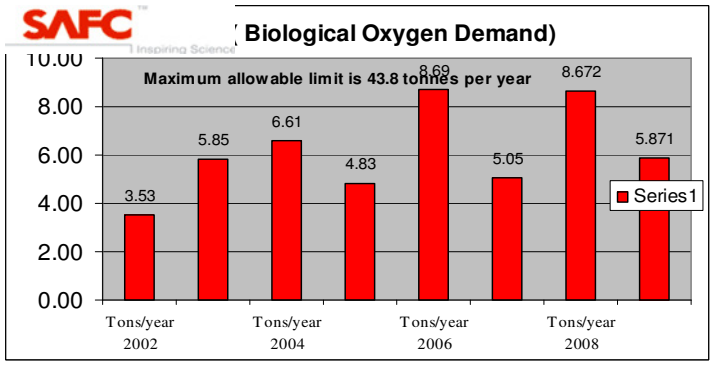
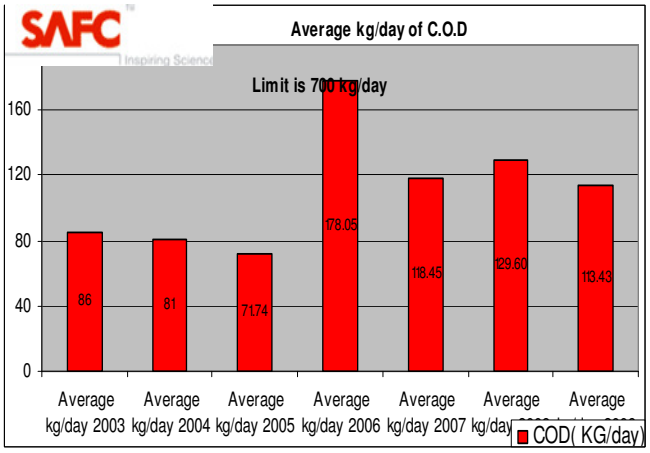
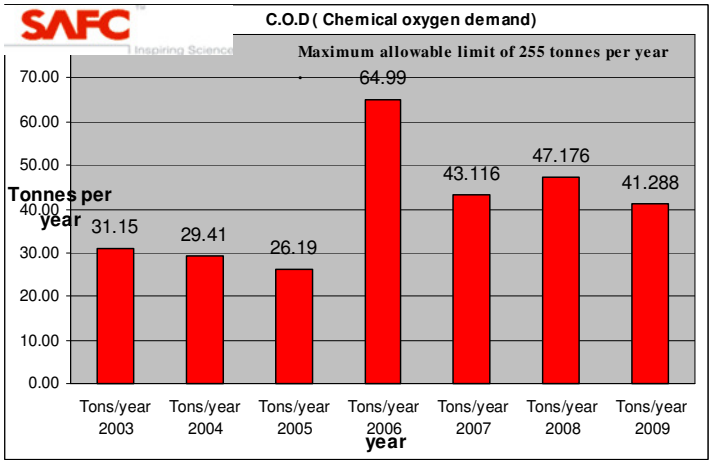
Trend analysis:

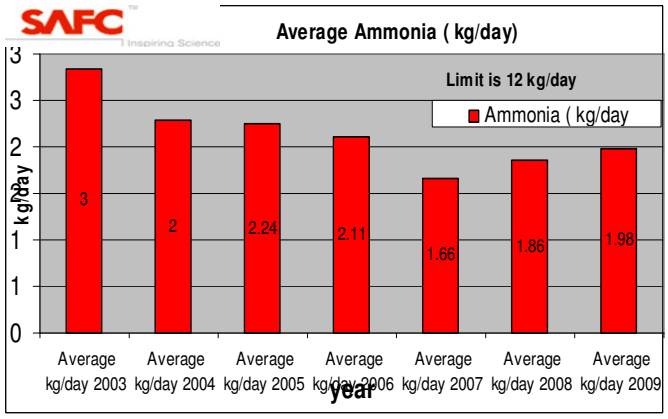
Graph 1: Average kg/day and tonnes per year of each parameter

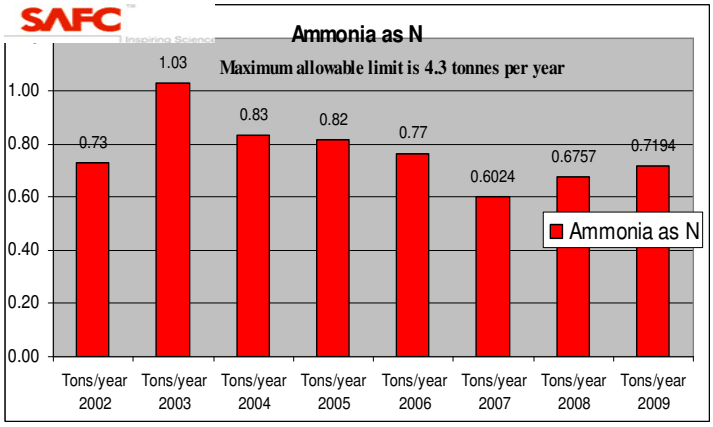












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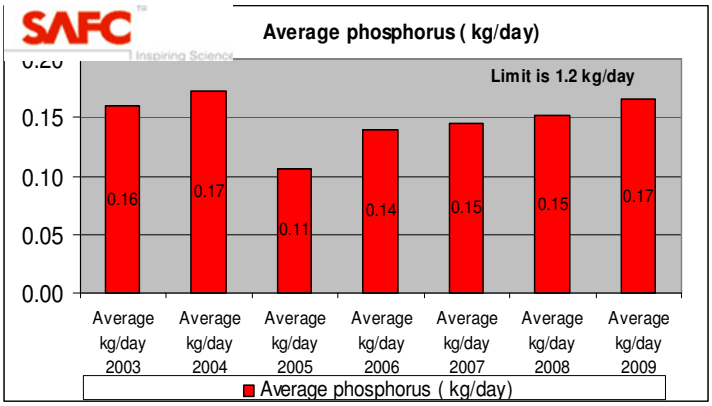
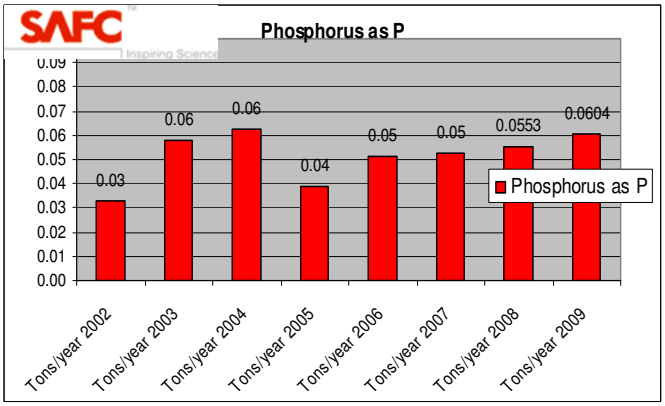
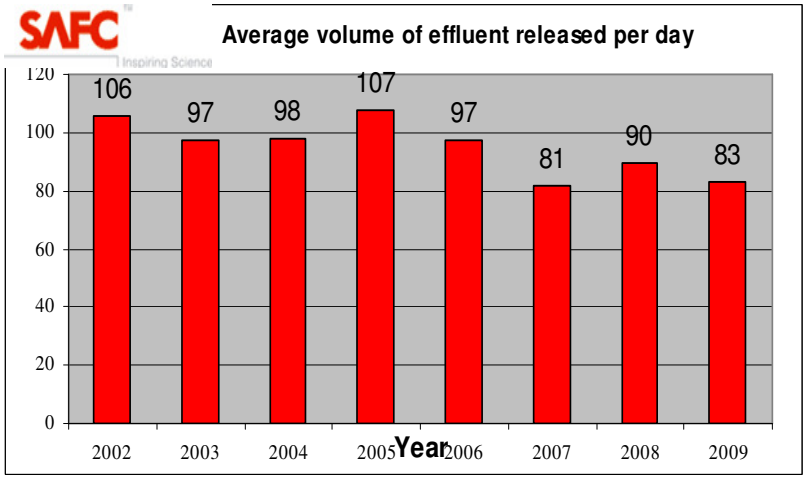




Graph 3: Average volume of effluent released to river



Note: The revised licence has enabled the company to increase the amount of effluent released to the river while adhering to the mass emission limit values as specified in the license.

12.2 Summary of surface water

48 samples were taken in accordance with license requirements. The average values recorded for each parameter are listed in the table below. There are currently no license limits set for the parameters however the site operates to a TOC Limit of 100ppm and pH range between 6 and 8. Volumes of surface water are not recorded therefore mass emissions could not be calculated.

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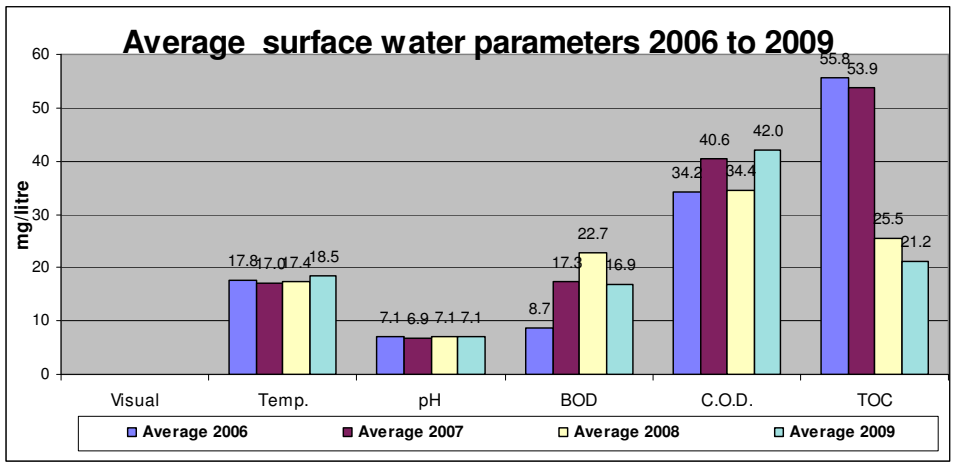
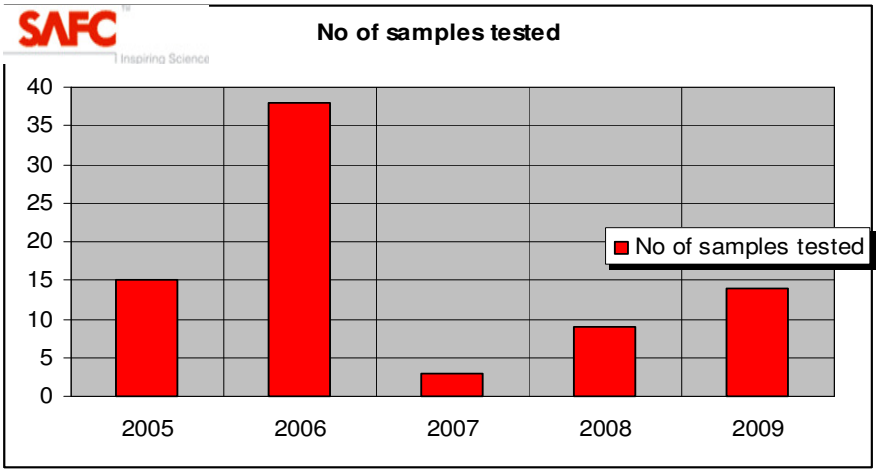


12.3 Toxicity Testing Summary 2009

Internal toxicity testing was performed on 3 internal aqueous samples between the period of Jan and December 2008. This increased to 14 samples in 2009. A summary of results is available in the appendices of the AER. All effluent results were within license limits.



12.4 Toxicity Testing Proposal 2009

In a recent audit dated 27 January, and report issued 16 feb 2009, the Agency specified that it does not require any further acute toxicity testing to be carried out at this time, however in the event that a decision is reviewed the Company propose the following:

The company proposes to commission Enterprise Ireland, Shannon aquatic toxicity laboratory to perform toxicity testing, in accordance with license requirements. It is proposed to continue using the same proposal and species used historically so that improvements can be traced over time.

In addition the company shall continue to test main aqueous phases using a microtox system and internal procedures.

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13 Reported Incidents Summary 2009

The following table gives a list of environmental incidents/ excursions from January 2009 to December 2009. A summary of all bypasses for 2009 is included in the Appendices of this report.

Date	Parameter	Emission point reference Number	Cause	Corrective action
10 Jan 2008	Suspended Solids 206 kg Vs 60 kg/day	W1	Low levels in final effluent buffer tank following Christmas shutdown	Effluent flow to the river stopped until levels in buffer tank exceed 10%.
14 Jan 2009	TOC breach of ELV 27.8 Vs 20.0 mg/m3	A1-7	2 exceedences of TOC ELV for CEMS	Checked processes going on in production at the time. Error was detected immediately. Called Environmental Manager, Checked calibration of unit, Fault with Fidamat unit itself to be further diagnosed with External services company contacted to verify /diagnose fault. This was completed by 15 Jan 2009 Damage due
03 Feb 2009	Suspended solids breach 99.184 kg Vs 60 Kgs	W1	Elevated levels of solids in SBR due to cold weather <- 2 C. This affected settle ability of effluent	Effluent flow to the river stopped. Additional Poly added to SBR, and sludge wastage increased.
18 Feb2009	NONC for audit dated 27 Jan 2009	N/A	Non compliance with IPPC license letter dated 18 feb 2009 from unannounced inspection performed on 27 January Ref P0089-03/nc01djm.doc	Letter sent to EPA dated 26 Feb 2009. All corrective actions have been completed or were in progress and verified by subsequent audit dated 11 June 2009. Fully compliant audit report issued
22 Feb 2009	TOC air emissions Breach, caused by blocked filters. There was No Production	A1-7	Full service completed	
14 May 2009	Unannounced inspection of env Laboratory operations Letter dated 26 May 2009	N/A	Lab operations, observations included in site's Environmental management Programme	
04 June 2009	Leak in WWTP caustic bund	W1	Actuator valve closed, Caustic pumped into cubes, Pumps to balance tank turned off, Seg and emergency tank pH were high Cordon off area to prevent access Surface water tag log showed elevated levels of pH, which caused the diversion valve to activate; there was no impact on the river. Checked surface water, cleared line and recalibrated pH probe. Reset CV6501 and 6502 to read 1 for open and 0 for closed.	Ensure WWTP checks are completed on all shifts Review line breaking permit procedure.

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Date	Parameter	Emission point reference Number	Cause	Corrective action
23 June 2009	Illegal dumping at back of WWTP at 12.34	N/A	Opel Zafira 03 D 47987. Ring WCC at 13.49 to report dumping, Download evidence and report to WCC.	The litter warden was on site today 24 June 2009 approx 15.00 hrs. He reviewed the evidence of Dumping at the back gate. He took details of the car registration and has identified the name of who the vehicle is registered to. He took a copy and Asked the security officer if he would verify or make a statement that it is true and correct. He advised the security officer that he may be requested in Court to provide evidence.
03 July 2009	Observations noted from audit dated 11 June 2009	N/A		Track observations to completion
08 July 2009	Noise complaint	N/A	The on – site maintenance person was called, who tried several times to turn off the alarm. This was then followed by the site electrician, who disabled the system until the cause was identified and rectified. The HR Manager called the complainant in the afternoon to explain the cause of the fault and apologised for the inconvenience caused	On investigation, it was found that the C5 area, lobby area and production areas were looped into 2 zones on the fire alarm Panel. This was amended to allow all three areas to be looped into 1 Zone. Break glass covers will be covered during future sanitisations. Drawings have been updated Training for maintenance personnel scheduled to be completed by External service provider (Wyleco).
12-Sep-09	Minor diesel leakage	W1	Spill has emanated from a pipe leak on a section of home heating diesel line feeding the Quality building boiler	EPA Notified and kept up to date with actions completed. All surface water has been contained on site Samples have been taken for analysis As a precaution, the section of pipe has been replaced. The river has been inspected a number of times, samples taken and it can be verified that there is No evidence of any negative impact on the river. URS Dames & Moore have visited the site to assist with the investigation and determine if there is an on-going risk of contamination. The site will continue with the investigation and update the Agency on any developments. Full remedial action Plan in place
18 September 2009	Noise complaint	N/A	On investigation, it was found that the process water tank had emptied. This feeds the cooling tower and feed water tank. Low water level in cooling tower caused temperature to increase which caused a build up of pressure. The pressure sensor failed to act at 21.5 bars, which caused the safety relief valve to go at 21.6 bars. The release of pressure from the safety relief valve, caused the hissing sound which led to the noise complaint	The TO was shutdown on Monday from 10.29 to 14:29 to investigate cause. (Planned shutdown-No production) Complainant was called at 15.30 approx on 21 September. An apology and explanation for the fault was provided

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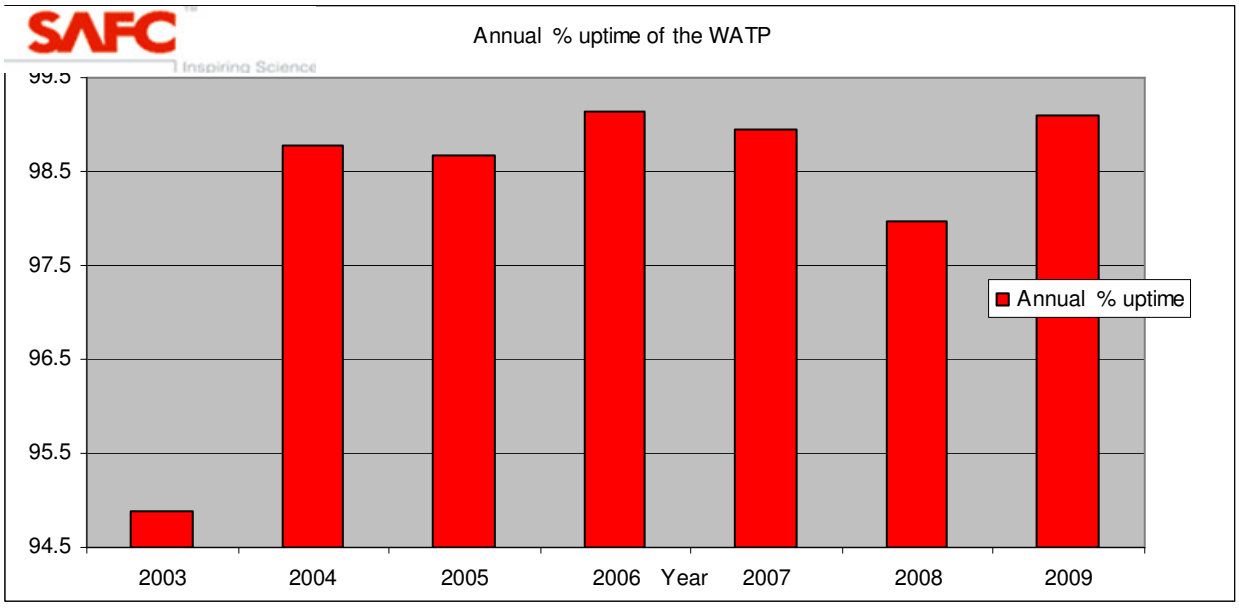
Comparison of Thermal oxidiser summary data

Year	No of bypasses	No of related excursions	Annual % uptime	Downtime (Hours)	Downtime (days)	TOC emitted for year(Kg / yr)
2003	230	0	94.88	269.00	11.22	483.39
2004	130	2	98.78	105.45	4.39	456.40
2005	143	0	98.66	114.44	4.77	555.28
2006	112	0	99.14	72.98	3.04	197.34
2007	129	17	98.94	86.48	3.60	255.48
2008	106	13	97.97	166.88	6.95	58.10
2009	81	2	99.09	74.22	3.09	60.17



The Percent run time for the thermal oxidizer was 99.09% in 2009. This is 1.12 % runtime equivalent to and improvement of 92.19 hrs runtime in 2009.The number of bypasses recorded was 106 for 2008 and 81 for 2009 further 24% improvement in the number of bypasses recorded.

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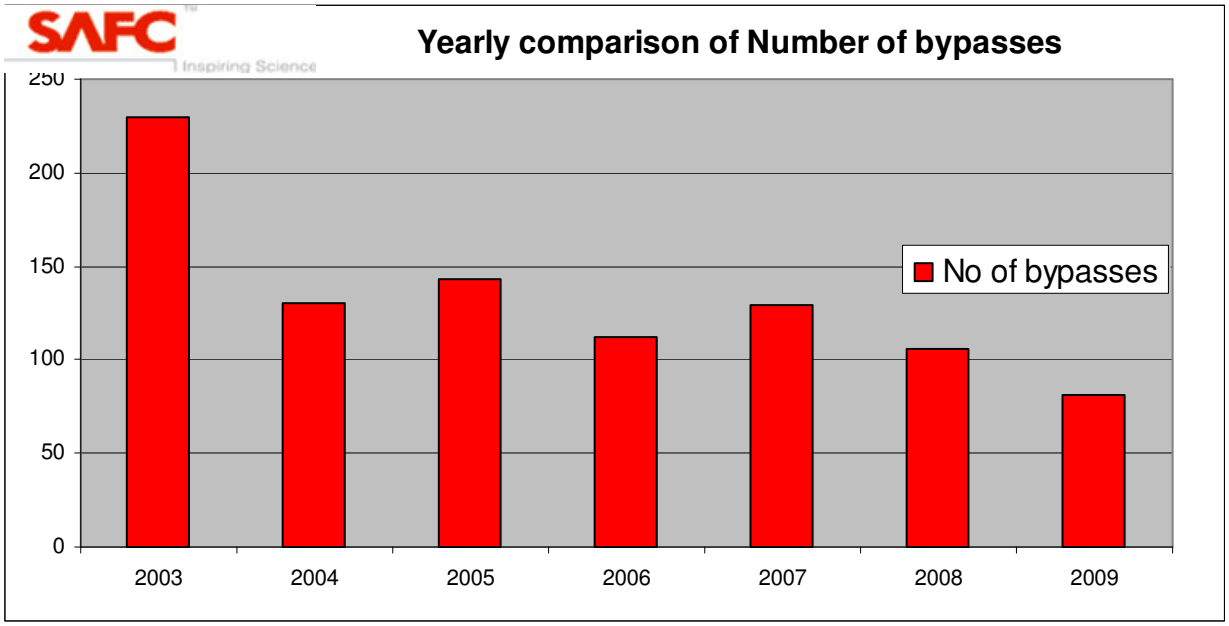

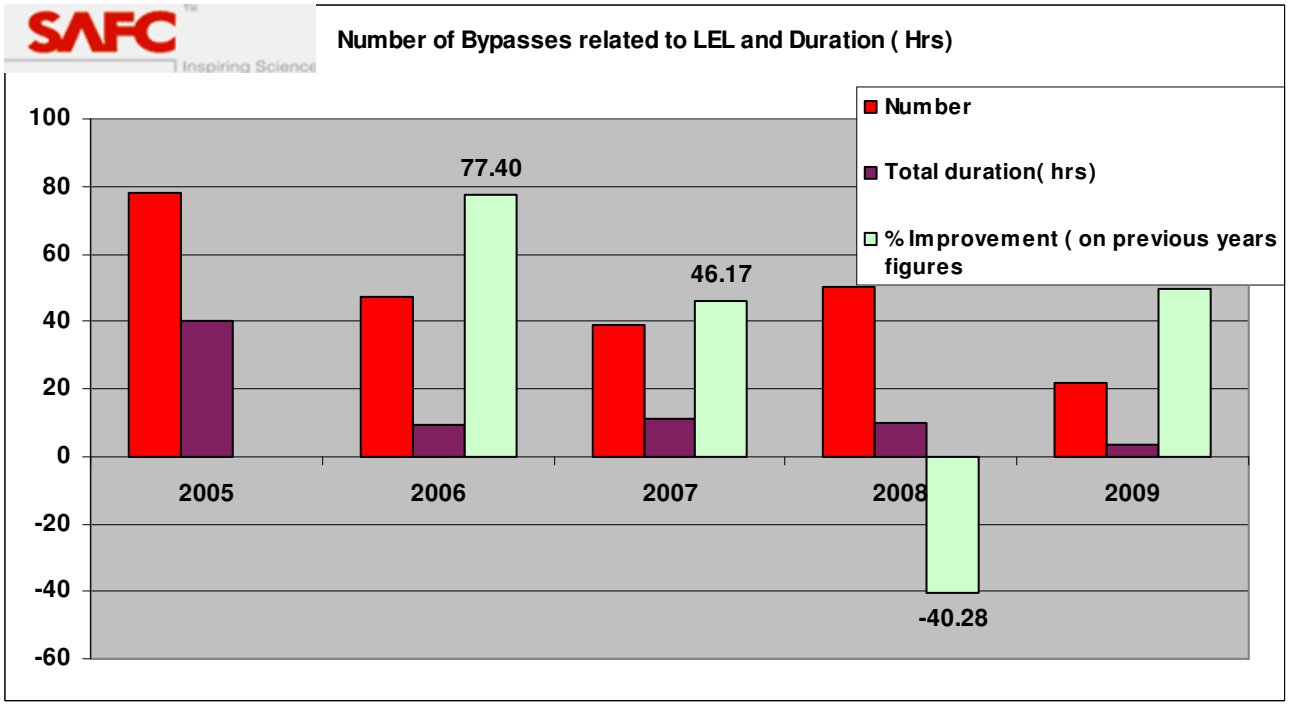

27 % of all bypasses were caused by elevated LEL's
The number of events caused by elevated LEL reduced from 50 in 2008 to 22 in 2009. **(56% Improvement)**
The duration of these although high was reduced from 10.08 to 3.6 hrs **(64% improvement)**
The mass emission associated with bypasses related to LEL's was 3.86 kg for the year

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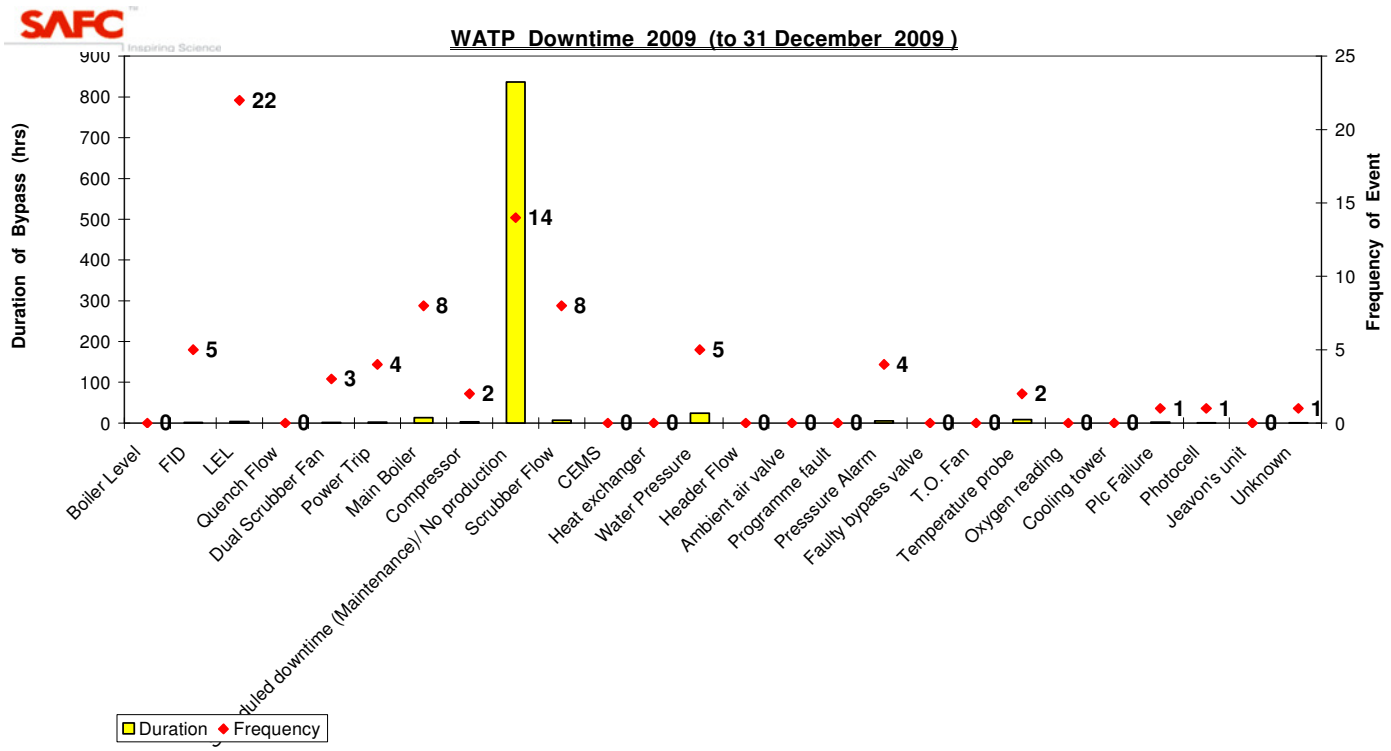
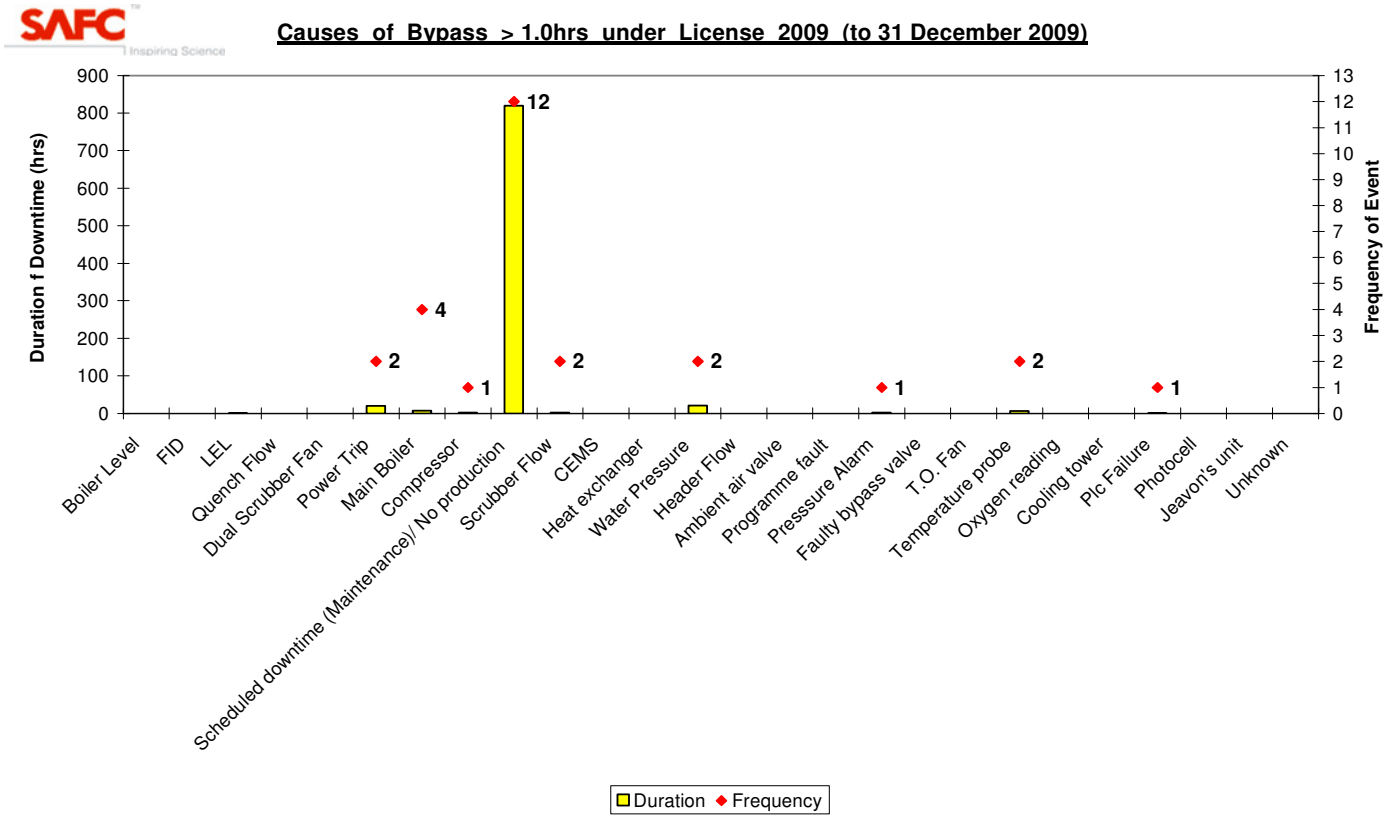


Total No of events broken down by category



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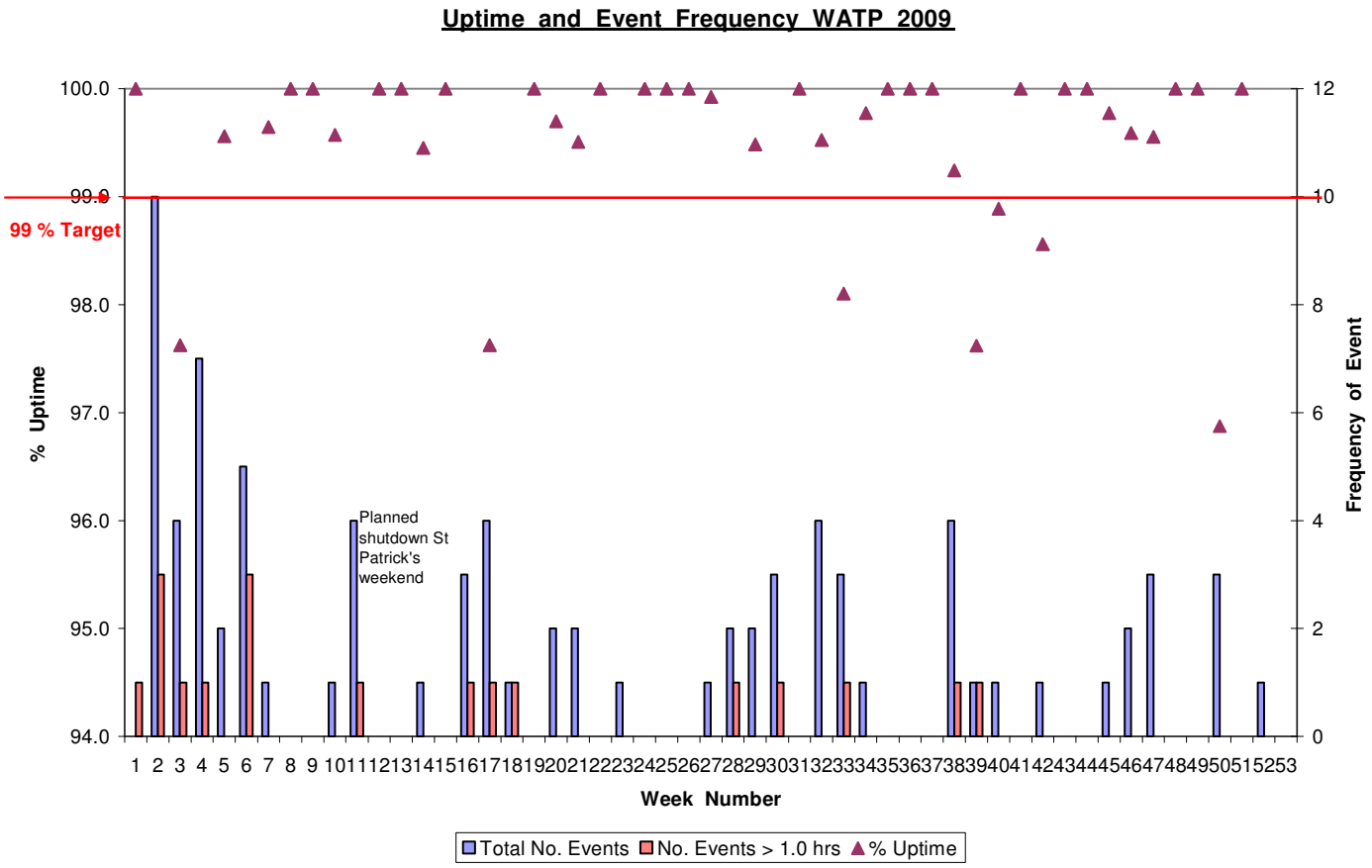
Number of events >1 hr duration
All of the tables above give a summary of the number of bypasses, which were notified to the Company's Licensing inspector and in accordance with relevant conditions of the license.



Main causes of bypasses/ shutdowns for the year

See Goal 2.1

Improvements were identified in the following areas:

See Goal 2.1

The company's goal was to continue to improve on this for 2009. This was achieved. A summary of the main improvements on improving Thermal oxidizer performance is discussed in more detail in Goal no 2.1 of the EMP (Environmental management programme report) in section 7 of the AER.

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14 Complaints Summary, 2009

There were 2 complaints received by the company with respect to this licensing activity for the period from January 2009 to December 2009.

Complaint class	Noise	Odour	Water	Dust	Procedural	Miscellaneous	Total
Total	2	0	0	0	0	0	2

Date	Parameter	Emission point reference Number	Cause	Corrective action
08 July 2009	Noise complaint- Caused by Site Fire alarm activation	N/A	The on – site maintenance person was called, who tried several times to turn off the alarm. This was then followed by the site electrician, who disabled the system until the cause was identified and rectified. The HR Manager called the complainant in the afternoon to explain the cause of the fault and apologised for the inconvenience caused	On investigation, it was found that the C5 area, lobby area and production areas were looped into 2 zones on the fire alarm Panel. This was amended to allow all three areas to be looped into 1 Zone. Break glass covers will be covered during future sanitisations. Drawings have been updated Training for maintenance personnel scheduled to be completed by External service provider (Wyleco).
18 September 2009	Noise complaint- Caused by Safety pressure relief valve lifting on Thermal oxidiser	N/A	On investigation, it was found that the process water tank had emptied. This feeds the cooling tower and feed water tank. Low water level in cooling tower caused temperature to increase which caused a build up of pressure. The pressure sensor failed to act at 21.5 bars, which caused the safety relief valve to go at 21.6 bars. The release of pressure from the safety relief valve, caused the hissing sound which led to the noise complaint	The TO was shutdown on Monday from 10.29 to 14:29 to investigate cause. (Planned shutdown- No production) Complainant was called at 15.30 approx on 21 September. An apology and explanation for the fault was provided

Note: Both complaints were investigated in an expeditious manner and to the satisfaction of the complainants.

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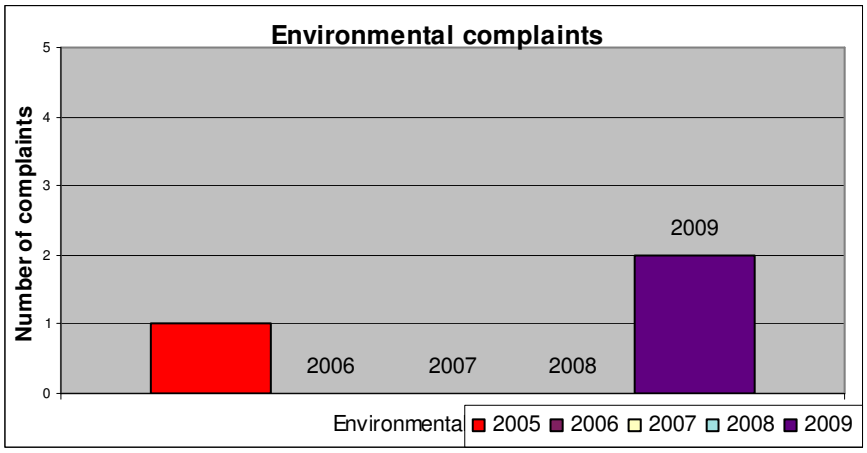

15 Noise Monitoring Programme 2010

In accordance with condition 6.13 of the Integrated Pollution Prevention and Control License, Sigma Aldrich Ireland Ltd, propose an external contract provider to perform the Annual Noise Survey as part requirement of the EPA Integrated Pollution Control License.

The company shall continue to perform the study in accordance with the conditions of the current version of IPPC License Reg No P-0089-4 and in the same format similar to previous reports.

The noise levels at the nearest noise sensitive location will be measured by day (30 minutes sample) and at night (15 minute sample).
The measurements will include $L_{Aeq,}$ L_{A10} and L_{A90} Levels. The measurement will be attended and an assessment of the noise attributable to Sigma Aldrich Ireland Ltd operation will be given.

The noise levels at the boundary locations previously measured (southern corner, southeastern corner and midway on the north- west boundary) will be measured by day (30 minutes sample) and at night (15 minute sample). The measurements will include $L_{Aeq,}$ L_{A10} and L_{A90} Levels. The measurements will be attended and an assessment of the noise attributable to Sigma Aldrich Ireland Ltd operations will be given.
The survey periods will be based upon the guidance within the EPA document “Environmental Noise Survey Guidance Document (ISBN 1-840995-113-3 issued in 2003).

An assessment of the presence of tonal or impulsive components of site noise at noise sensitive locations will be conducted.
A-weighted sound pressure levels will be measured at the specified distance for the noise sources listed in schedule C.5 of the licence.

16 Noise Monitoring Report, 2009

City Analysts Ltd was contracted by Sigma Aldrich Ireland Ltd to conduct a noise survey in accordance with the requirements of the license and the recent guidance notes issued by the Environmental Protection Agency. This was completed in June 2009. The survey data was analysed and it was concluded that the site is in compliance with condition 6.13 of the IPPC license. A comparison of the results since monitoring began is illustrated below.

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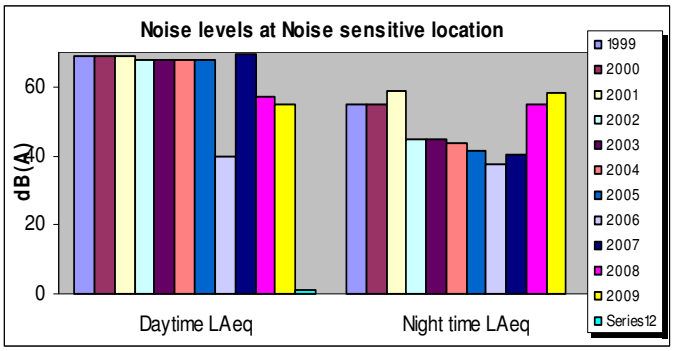
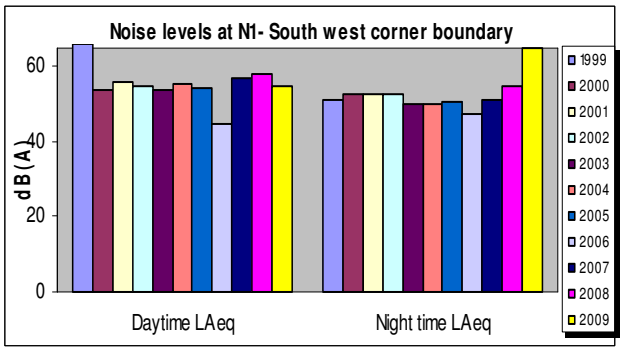
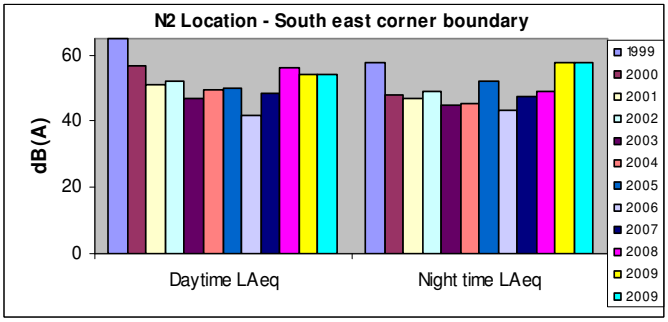
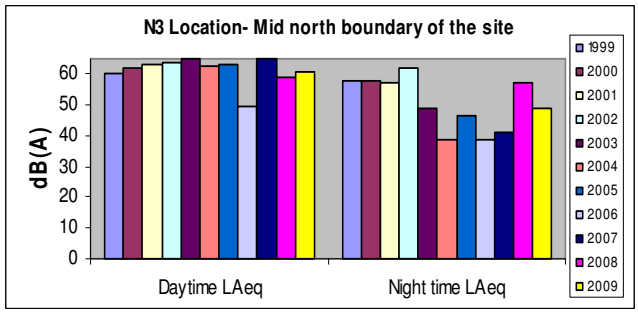
A detailed report from the Consultant firm was submitted to the EPA as part of the quarterly monitoring returns during the Month of September 2009.

It is proposed to carry out the survey during the third quarter of 2009.
A record of the survey results shall be available for inspection by any authorised persons of the Agency, at all reasonable times and a summary report shall be included as part of the Annual Environmental report.









The Noise measurements at the Noise sensitive location to the South of the Sigma Aldrich Ireland Ltd site show that the traffic on the Vale road dominates above all other potential Noise sources in the area. The background measurements of LA90 are found to be the same during both the day and night.
This fact shows the influence of the road at the noise sensitive Location. The slight difference in LAeq between the daytime and Night time measurement again clearly shows that the almost continuous stream of traffic on the road has the most significant impact on the Noise sensitive location. The Analysts notes state that there was No audible significant tonal or impulsive noise from Sigma Aldrich Ireland Ltd site at the Noise sensitive location, therefore it would be in his opinion that the site is compliant with the limit values as set out in IPPC License No P0089-3/ P0089-4.

17 Groundwater Monitoring Summary 2009

The site has 10 groundwater wells on site. These boreholes were required to be monitored Bi annually in accordance with Schedule 5(ii) of the IPPC licence register P0089-3. These were monitored in April and October 2008.
An independent review of groundwater monitoring data was completed in May 2008
In summary, the review of the results shows that there is a successive decline in the historical contamination on site. In addition, the extra study confirmed that there was no potential for impact VOC impact on the Ground waters at the site continues to decrease and that the MNA strategy is effective at the site

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The company will continue to update the existing groundwater quality database and will assess current groundwater quality.

A summary of results of groundwater monitoring performed in accordance with license requirements is included in the attachments section of the AER.

18 Tank and pipeline testing and inspection report

Leak tests were performed on a number of Bulk storage tanks on site, a number of tanks at the WWTP were also emptied, sludge removed, cleaned and visually inspected. These included the Sequencing batch reactor, Waste activated sludge tank and final effluent buffer tank. Details of all of these inspections are retained on file and a summary of tanks inspected, is also included in the Bund Register summary for 2009.
All underground process drains were tested in August 2009, and again in October 2009 a report was completed by Horizon. The full report is included in the attachments section of the AER.

19 Bund Testing report 2009

In accordance with Condition 9.4.2,"the integrity and water tightness of all Bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated to be to the satisfaction of the Agency".
All bunds shall be tested at least once every three years. A report on such tests shall be included in the AER.
Bunds continue to be visually inspected on a regular basis by the production department. A programme is in place to ensure they continue to be tested at least at 3 yearly intervals. The company shall continue to test bunds in accordance with license requirements. The latest version of the bund register, which summarizes all bunds tested in 2008, is included in the attachments section 25.6 of the AER.

20 EPA National waste database 2009

National Waste database Data Report Sheet						
Industrial sector NACE Code (Two letters and max four numbers)	D	DG				
Reporting period	2009					
Number of employees for reporting period	88					
Total tonnage of waste Produced Hazardous Non Hazardous	1176.17 tons 951.17 tons 225.00 tons					
Total tonnage of waste recovered Hazardous Non Hazardous	1005.67 tons (86%) 881.45 tons (93 %) 124.22 tons (55%)					

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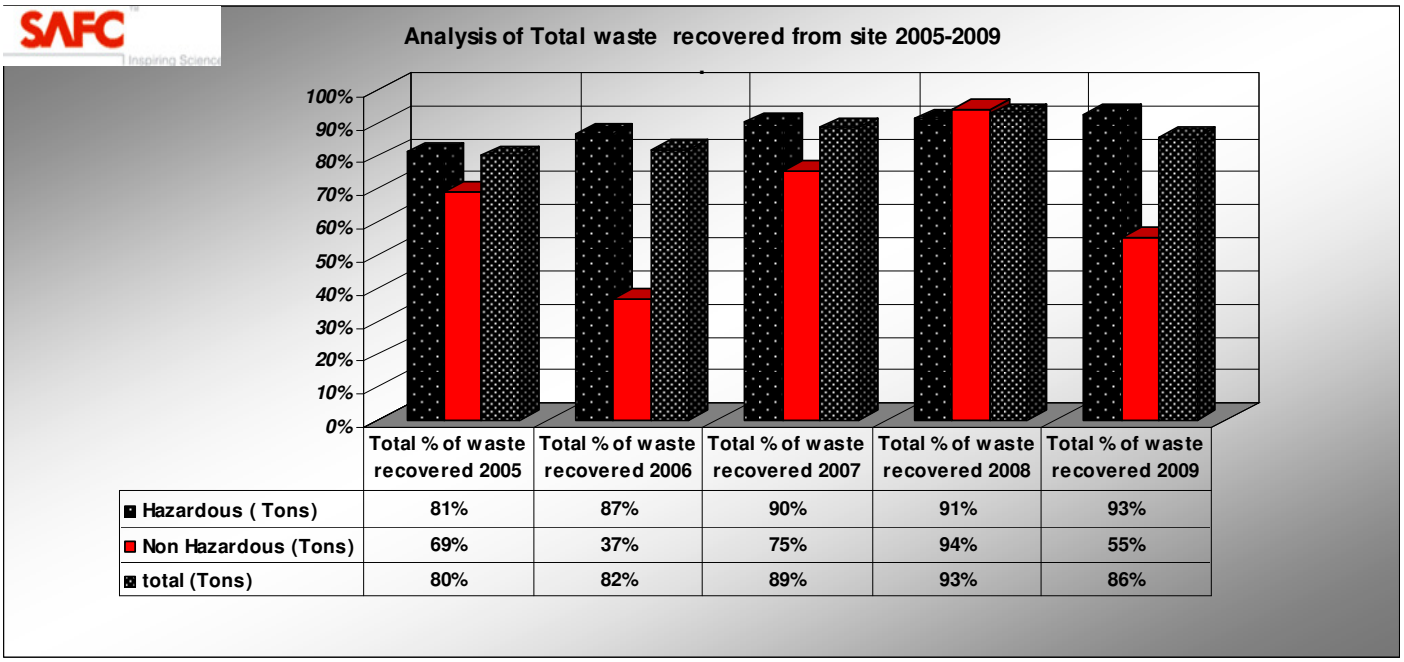

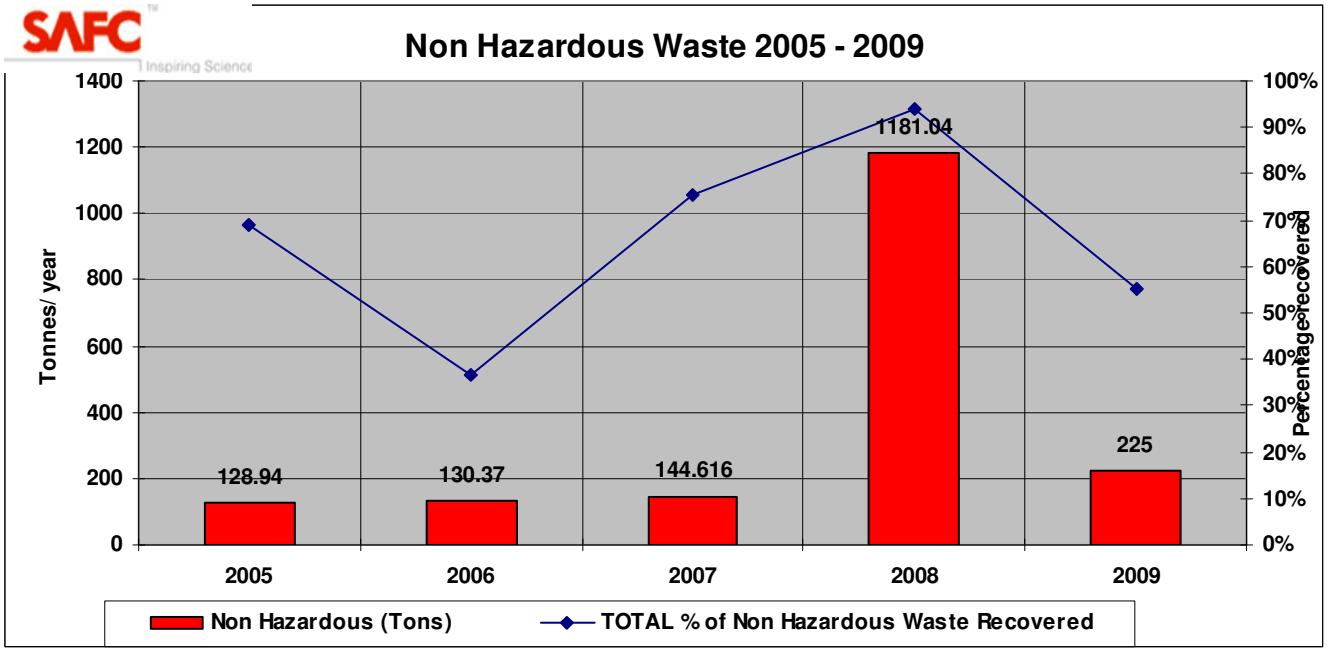

Full details of waste generated is located in attachments section of the AER 25.10

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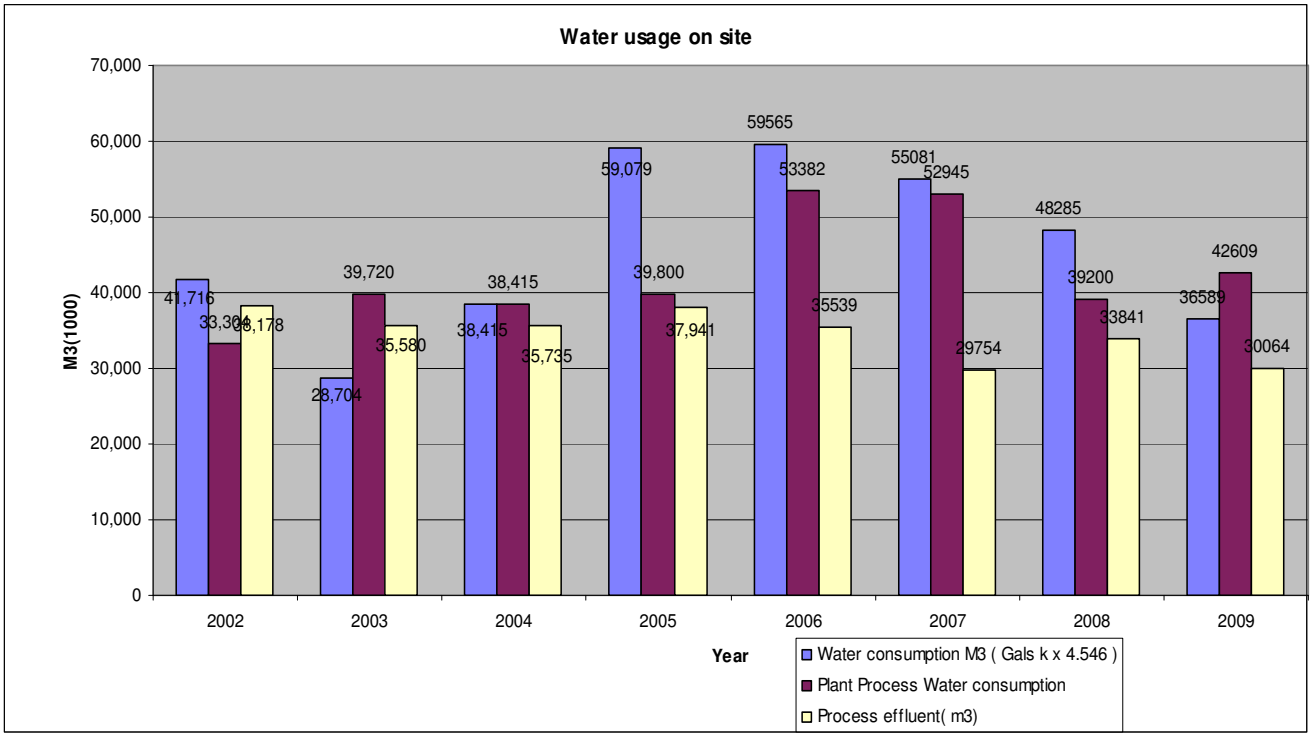
21 Resource Consumption Summary 2009

Date	Process water m^3	Process water to cooling tower m^3	Town water m^3	Town water to boiler m^3
1998	30,065	20,720	99	34,821
1999	37,180	20,106	61.38	1888
2000	28,664	14,814	132.5	98.6
2001	34,011	8039.6	103.7	800
2002	41,716		21,700	2237
2003	39,720		12,287	2064
2004	38,415		38,415	
2005	39,800		59,079	30,747
2006	53,382		56,843	3786.125
2007	52,945		62,512	2002.959
2008	39,200		48,285	3847.948
2009	42,609		42,609	2833.404



21.2 Effluent

In 1998 approximately 64,985 m^3 of water was used on site. 30,065 m^3 was used as process water. 20,720 m^3 of this process water was used in the cooling tower to provide cooling for reactors and condensers. 35,770 m^3 of process effluent was produced during the year. Canteen usage amounted to 99 m^3 for drinking water supply and 34,821 of town

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water were used for the boilers. A discrepancy of 5705 m^3 is obtained and this is attributable to the surface water ingress into the wastewater treatment plant via the bund at the barrel platform.

In 1999, 40,680 $m^{3\ of}$ process effluent was released to river.37, 180 m^3 of water was used as process water approximately 54% of this was used in the cooling towers. 1888 m^3 of town water was used for the boilers. 61 m^3 of town water was used for drinking water supply.

In 2000, 36,193 m^3 of process effluent was released to the river. 28,664 m^3 of water was used as process water. Approximately 51.6% was used in the cooling towers (14814m3). This figure has reduced by 16% on 1998 figures.

A discrepancy of 7529 m^3 is obtained between process effluent treated and process water used. This accounts for the amount of surface water arising on site and has increased by 32% on 1998 figures. The increase is attributed to the improvements in the upgrade of all bunds and a procedure whereby all bunds are checked on a daily basis by production. During period of heavy rainfall, bunds are pumped directly to the emergency tank, to minimise any possibility of surface water contamination.
98.6 m^3 of town water was used for the boilers.132.5 m^3 of town water was used for drinking water supply and Canteen use.

In 2001, 68,841 m3 of water was used on site. 34,830m3 of process effluent was released to the river. 34,011 m3 was used as process water. 23.6 % of this was used in the cooling towers (8039.6 m3) therefore this figure has reduced by 61 % on 1998 figures.

A discrepancy of 819 m3 is obtained between process effluent treated and process water used. This means that 819 m3 of water is due to surface water that has been treated at the wastewater treatment plant. This is a reduction of 85.6 % on 1998 figures and an 89% reduction on 2000 figures for surface water. 800 m3 of town water was used for the boilers.

In 2002, 41,716 m3 of water was used on site.38, 178m3 of process effluent was released to the river. 33,304 m3 was used as process water to the plant. A discrepancy of 4874 m3 is obtained between process effluent treated and process effluent used, which is due to surface water which was treated at the WWTP. A project was completed in 2002 to divert surface water from roads getting onto the site, which will reduce this figure in future calculations. 2,237m3 was used as water for the boilers. This includes the thermal oxidizer boiler.

In 2003, 39,720 m3 of water was used on site.35,580m3 of process effluent was released to the river. 28,704 m3 was used as process water to the plant. 10.135m3 was used as water for the boilers.

In 2004, 38,415 m3 of process water was used in the plant. 35,735 m3 of process effluent was released to river.

In 2005, 39,800m3 of process water was used in the plant. 37,941 m3 was process effluent and was released to the river. A water leak was detected in 2005. This accounts for the increased volume of water recorded from the mains meter in 2005. 3,879 m3 was used in the boilers.

In 2006, 53,382 m3 of process water was used in the plant. 35,539 m3 was process effluent. A water leak was detected in 2005 and repaired late January 2006. This accounts for the increased volume of water recorded from the mains meter in 2005 and 2006.

In 2007, 52,945 m^3 of process water was used in the plant, 29,754 m^3 was process effluent.
In 2008, 39,200 m^3 of process water was used in the plant, 33,841 m^3 was process effluent.
In 2009, 42,609 m^3 used as process water, and 30,064 m^3 was process effluent.

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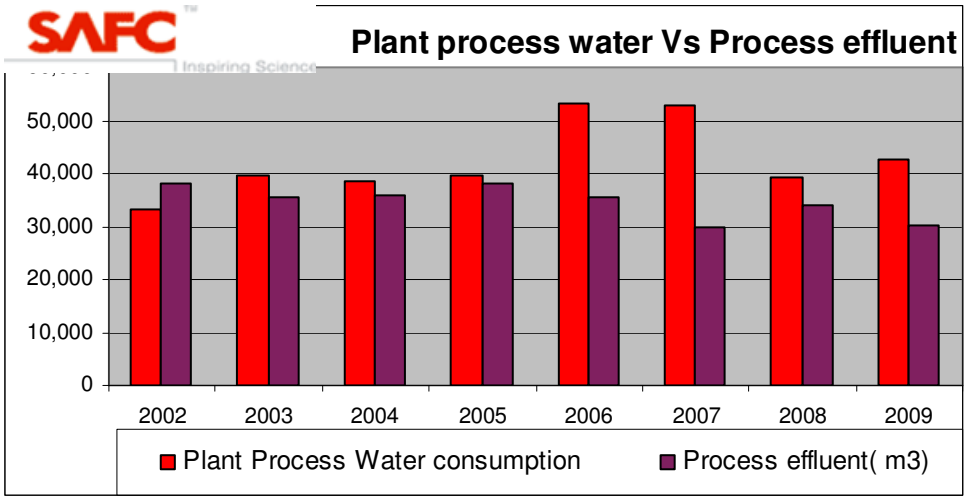
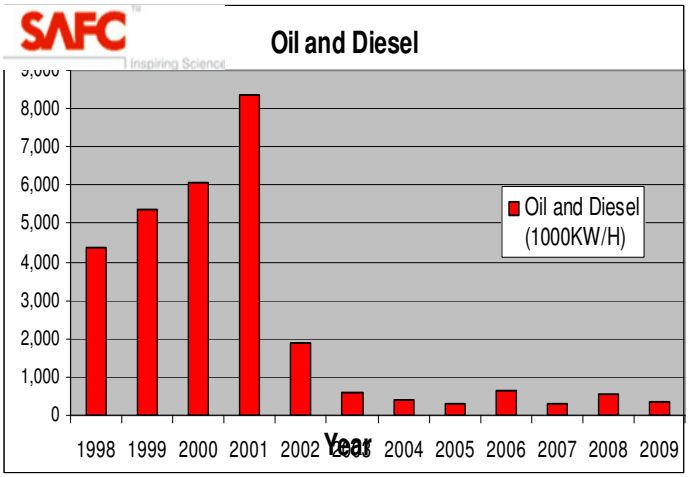
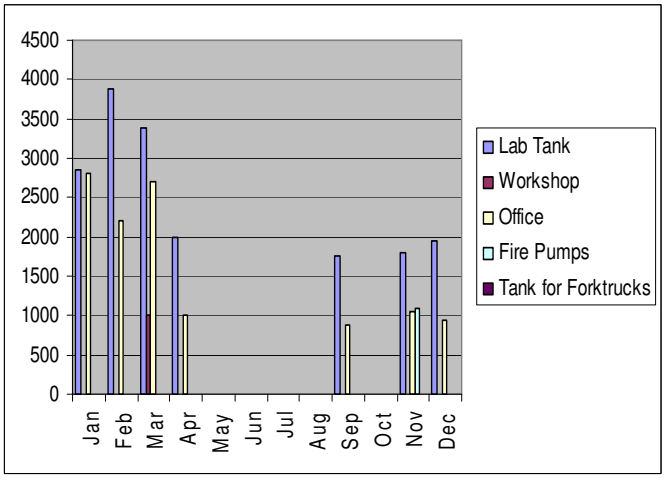


21.3 Oil and diesel

Approximately 394,333 Litres of Diesel oil was used for 1998. This figure increased in 1999 to 483,385 litres. The increase can be attributed to the capacity increase in plant and more efficient production .In 2000 the figure increased to 542.657 l. In 2001 this figure increased to 746,710 litres. This increase is attributed to the installation and commissioning of the thermal oxidiser.
In 2002, 170,400 litres of diesel was used on site. 62,885 l of diesel was used for the thermal oxidizer.
In 2003, 54,000 litres of diesel was used on site, 10,124 litres was used for the thermal oxidizer.
In 2004, 34,691 litres of diesel was bought on site none was used for the thermal oxidiser.
In 2005, 25,057 litres of diesel was bought. This represents a 28 % reduction on 2004 figures, representing a CO2 equivalent of 21,849 kg reduction.
In 2006, 59,194 litres of diesel was bought.20.87 m3 of this was used in the thermal oxidizer between 11 and 19 September due to a fault with the TO gas regulator.
In 2007, 28,186 litres of diesel was used. There was none used in the thermal oxidizer in 2007.
In 2008 49,806 litres of diesel was bought in. There was none used in the thermal oxidizer for 2008.
In 2009 31,299 litres of diesel was bought in. There was none used in the thermal oxidizer in 2009.





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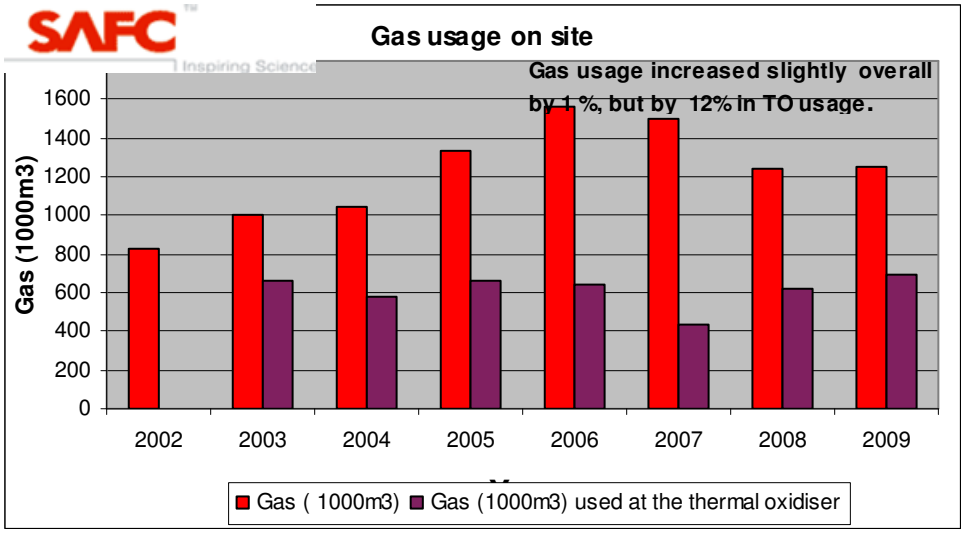
21.4 Natural Gas

In 2002, 831,000 m^3 was used on site/ 525,000 m3 was used in the boiler house and 305,000 m3 was used for the boiler associated with the thermal oxidizer.
In 2003, 1003,400 m^3 was used on site 661,100 m3 was used for the boiler associated with the thermal oxidizer. The remainder was used for the two additional boilers on site
In 2004, 1,047,863 m^3 was used on site, 581,570 was used for the boiler associated with the thermal oxidiser.
In 2005, 1,202,500 $m^3$was used on site 661,946 was used at the thermal oxidiser, this again represents 55 % of the total gas usage on site.
In 2006, 1,564,000 m^3 was used on site, 644,855 m^3 was used in the thermal oxidizer. This represents 41% of total gas usage on site.
In 2007 1,499,564 m^3 was used on site .435,859 m^3, was used in the thermal oxidizer. This accounts for 29% of total gas usage on site.
In 2008 1,242,327 m^3 was used on site 616,154 m^3, was used in the thermal oxidizer. This accounts for 49% of total gas usage on site. Overall gas usage reduced by 17% on 2007 figures. This is attributed to Energy consumption reduction projects completed in 2008.
In 2009 1,256,628 m^3 was used on site. 690,765 m3 was used at the thermal oxidizer. This accounts for 55% of total gas usage on site. Gas usage increased slightly overall by 1 %, but by 12% in TO usage. 26% Reduction in cost.



21.5 Nitrogen

122,542 litres of Liquid nitrogen was used in 1998 for inerting reactors and vessels. This figure increased to 176,648 litres. Again this is due to capacity increase in plant and production. In 2000 the amount of nitrogen used was 153,200l. In 2001 this figure increased to 275,556 l and in 2002, the figure exceeded 400,805 litres. In 2003, 348,175 litres was used on site. This is a 13 % reduction on 2002 figures.
In 2004, 332,625 litres of nitrogen was used on site,
In 2005 372,508 litres of nitrogen was used on site. This is a 7 % reduction on 2002 figures.
In 2006 425,702 litres of nitrogen was used on site.
In 2007 391,720 litres of nitrogen was used on site.
In 2008 245,313 litres of Nitrogen was used on site. This is a 37% reduction on 2007 figures
In 2009 220,276 Litres of Nitrogen was used on site. This is a 10.2 % reduction on 2008 figures

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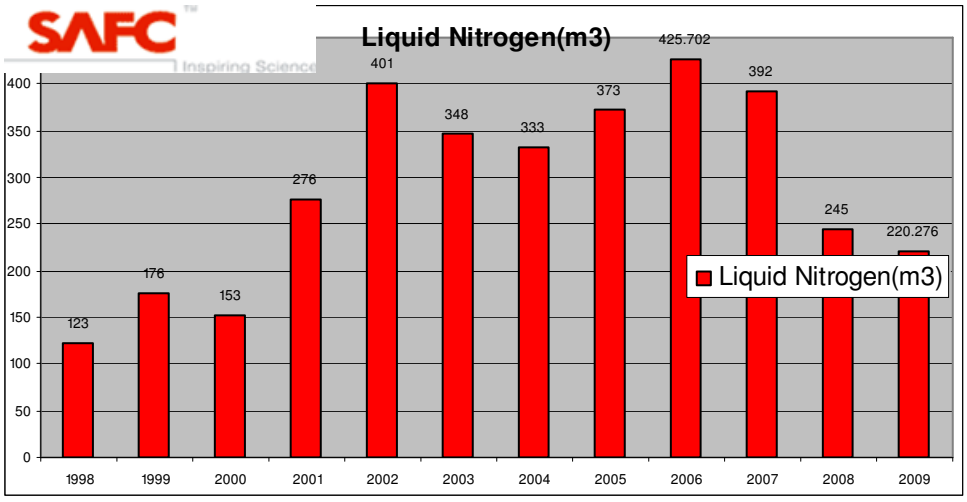

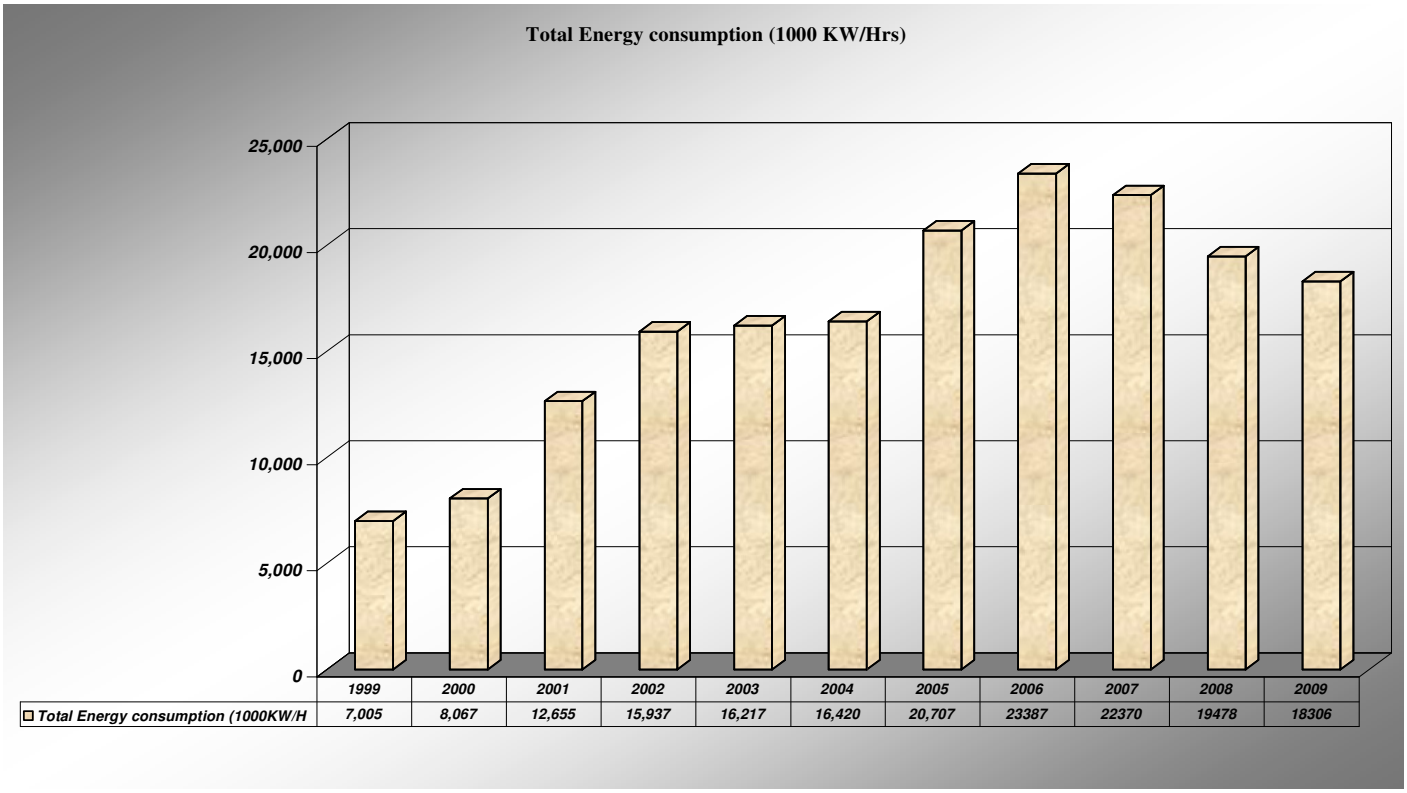

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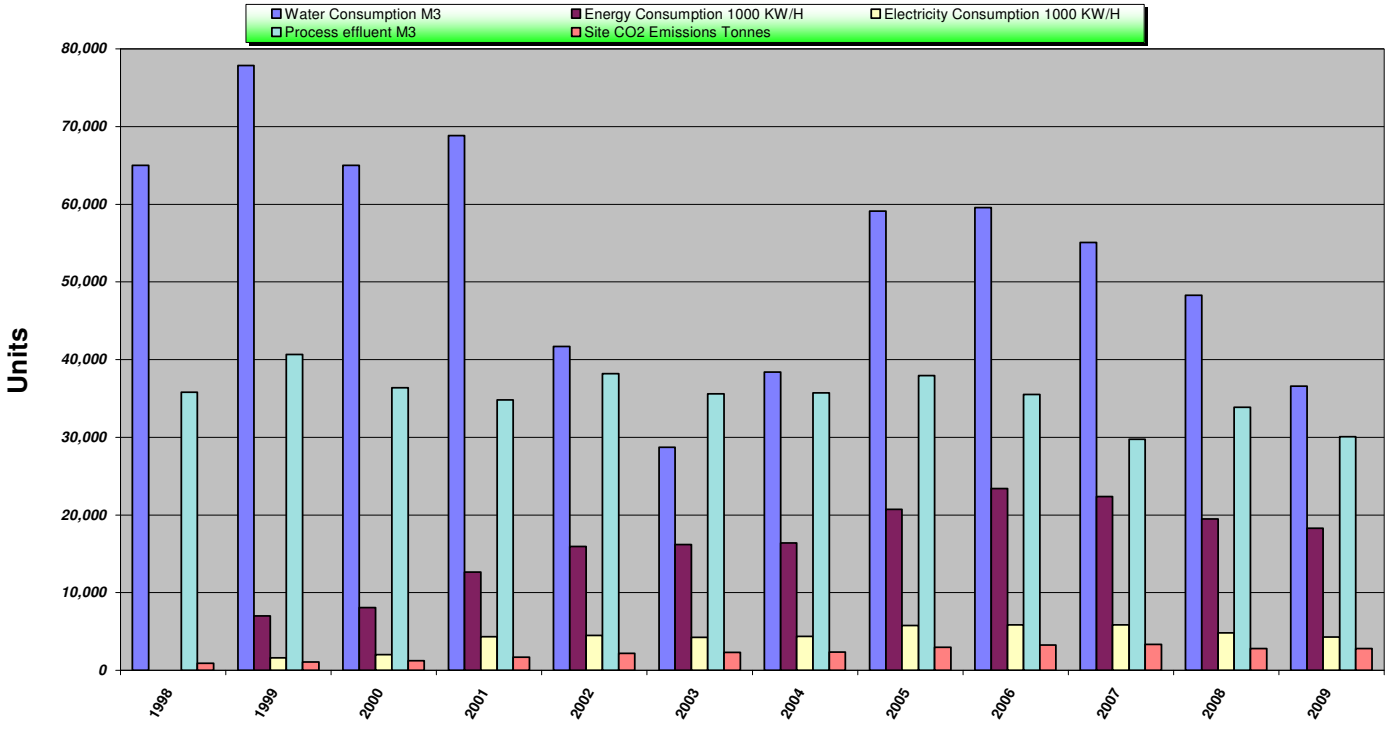
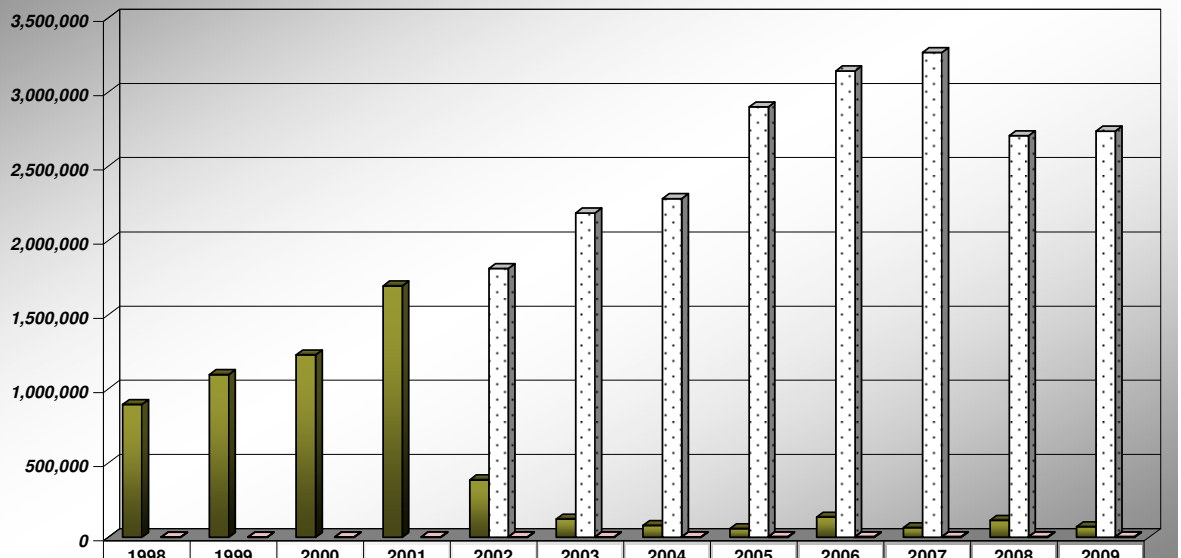
Resource Consumption Summary



Total site CO2 emissions



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Oil and Diesel CO2 equivalent (Kg)	894,272	1,095,444	1,229,256	1,693,534	386,467	122,472	78,679	56,829	134252	63926	112960	70986
Natural Gas CO2 Equivalent (kg)					1,809,918	2,185,405	2,282,246	2,898,599	3142528	3266050	2705789	2736937
Total Site CO2 Emissions Tonnes	894	1,095	1,229	1,694	2,196	2,308	2,361	2,955	3277	3330	2819	2808

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22 Review of Environmental Liabilities insurance Cover 2009

The amount of indemnity was revised and proof of revision of the financial indemnity required under Condition 12.2.1 of licence register P0089-4, was forwarded to the Agency in Mar 2010.
The Environmental liabilities insurance cover shall be revised annually as specified as per Condition 12.2.3 of IPPC License Register P0089-4.
The ELRA _ Environmental Liabilities risk assessment was completed in June 2008 and submitted to the EPA as part of the quarterly monitoring returns for September 2008.

23 Review of Residuals Management plan/ CRAMP

The Residuals Management plan was submitted to the EPA in October 1998. In accordance with conditions 10.1 – 10.4 (Decommissioning & Residuals Management), of Sigma Aldrich Ireland Ltd, Integrated Pollution Control Licence Register number P0089-03, the Company submits an update of its Closure, Restoration and Aftercare Management Plan (CRAMP), formally Residuals Management Plan, in which details the planned cessation of all or part of the site, a plan to decommission, render safe, or remove for disposal / recovery , any soil, subsoil's, buildings, plant and equipment, or any waste materials, substances, or other matter contained therein, or thereon , that may result in environmental pollution. (Condition 10.1)

In accordance with condition 12.2 (Environmental Liabilities Financial Provisions), and 10.3.5 a fully detailed and costed plan for the decommissioning or closure of the site or part thereof is included. Following agreement of the agency, this plan shall be reviewed annually, and proposed amendments notified to the Agency for agreement as part of the Annual Environmental Report. (10.2.2)

A scope statement of the plan (condition 10.3.1) is included along with the programme to achieve the stated criteria. In the event of closure of the site a final validation report including a certificate of completion for the CRAMP shall be submitted to the EPA three months of execution of the plan (condition 10.4). The company proposes to submit certification as requested by the agency to confirm that there is no continuing risk to the Environment.

The Guidance Documents and Assessment Tools in Environmental Liabilities Risk Assessment and Residuals Management Plans incorporating Financial Provision Assessment, May 2005 (EPA Contract OEE-04-04) and Environmental Liabilities Risk Assessment (June 2008) prepared by URS Ireland on behalf of SAFC Arklow Ltd were used in the preparation of this Closure, Restoration and Aftercare Management Plan guidance. A copy of the CRAMP is in the attachments section of the AER.

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24.0 Related Documents

24.1 AER electronic reporting system and PRTR requirements
24.2 ISO 14001 :2004 Certification
24.3 Corporate EHS Policy
24.4 Site Environmental Policy
24.5 Toxicity testing results 2009
24.6 Groundwater review report dated Feb 2010
24.7 Pipeline testing reports- Horizon
24.8 Bund testing report 2009
24.9 Tank inspection summary 2009
24.10 Reported bypasses summary 2009
24.11 Hazardous waste report 2009
24.12 Carcinogens report 2009
24.13 CRAMP/ Financial Provisions review
24.14 CEN 14181