



TEST PROGRAMME FOR **BAG FILTER**

March 2020

GALCO WATERFORD LTD

Gracedieu Road,
Waterford
P0385-01

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1.0 Introduction

This Test Programme has been drafted in order to satisfy Condition 5.2 of the Industrial Emissions Licence (IEL) of number P0385-01. Condition 5.2 of the Industrial Emissions Licence (IEL) of number P0385-01 states the following;

“5.2 *Test programme:*

5.2.1 *The licensee shall prepare, to the satisfaction of the Agency, test programmes for any abatement equipment installed for air emissions control. These programmes shall be submitted to the Agency, prior to implementation. These programmes, following agreement with the Agency, shall be completed within three months of the commencement of operation of the abatement equipment.*

5.2.2 *The test programme shall include as a minimum, the following:*

- (i) Establish all criteria for operation, control and management of the abatement equipment to ensure compliance with the emission limit values specified in this licence.*
- (ii) Assess the performance of any monitors on the abatement system and establish a maintenance and calibration programme for each monitor. ”*

2.0 Responsibilities

Senior Management are responsible for the following;

- Ensuring all employees are aware of the procedures and inspections to be employed in relation to this Test Programme.
- Assigning of duties and activities to be performed in relation to this Test Programme.
- Ensuring that the Test Programme maintenance procedures, inspections and activities are being performed and completed.
- Ensuring all logs documenting the performing of the Test Programme maintenance procedures, inspections and activities duties are filled out and completed.
- To follow up on insufficient practices and to implement corrective actions for same.
- Ensuring that all necessary resources are provided in maintaining good standards and practices in relation to this Test Programme.

Business Manager – Cheryl Cusack

Production Manager – James Murray

Maintenance Manager – Ward Murray

Group EHS is available for any support required.

3.0 Criteria for Operation

- The Bag Filter Unit is a High Efficiency Particulate Air (HEPA) filter used for the abatement of emissions from the galvanising process.
- The dust-laden air enters the bag filter bustle which is ducted from a canopy over the pot.
- The air is uniformly distributed avoiding channelling.
- Initially a coat of material forms on the bags. Subsequently, the coat acts as the filtering medium.
- The dust is accumulated on filter elements while the air passes thorough the filter bags from outside to inside.
- The accumulated powder is dislodged from the bags by reverse pulse-jet air intermittently (20 second intervals).
- The dislodged powder falls on bottom cone and is discharged through powder discharge valves.
- The dust free air is sucked by induced draft fan and is exhausted to atmosphere.
- Knockers are provided on conical portion especially for sticky/hygroscopic materials.

4.0 Main Components / Parameters of Bag Filter

4.1 Bag filter housing

- Bigger housing size ensures for sufficient filtering area and low velocity. It ensures minimum pressure drop across bag filter. This reduces the blower power consumption.
- Bustle type construction at the air inlet assures uniform air distribution. This avoids channelling of air and hence gives consistent bag filter performance.
- Bottom cone angle of bag house cone is 45° so that the powder slides freely.
- Higher area is provided for air passage to keep the velocity low. This avoids powder "re-entrainment" and resultant bag choking.

4.2 Filter bags

- We carefully select filter bag fabric considering temperature, particulate size, and air-to-cloth ratio.
- HEPA (High Efficiency Particulate Filters) can remove at least 99.97% of airborne particles 0.3 micrometres (μm) in diameter. These filters can efficiently filter very small penetrating particles with a greater efficiency. The HEPA filters are composed of a mat of randomly arranged fibres.
- The Felt media bag minimizes pressure fluctuations giving uniform and high collection efficiency. This is reflected in our high level of compliance.
- Specially selected Anti-stick coating on bags minimises bag choking.

4.3 Bag cages

- Cages are made out of larger diameter bars to make the assembly rigid.
- The pitch between bars is kept less to adequately support bags by cages. This avoids flex line failure between the vertical wires.
- Careful selection of fit relationship between cage and bag avoid premature bag failure.

4.4 Filter bag–Venturi assembly

- Higher thickness Venturi mounting plate –uniform pressure is applied - seals better.
- Venturi are cast –rigidity in clamping reducing leakages.
- Special Silicone gasket ensures Leak-proof joint between Venturi and Venturi mounting plate.
- Clamps are provided to hold the bags on cages and seal for leakages.

4.5 Pulse-jet air cleaning assembly

- A high efficiency two stage “pulsing mechanism injection cleans the filter sleeves continuously and automatically at intervals of between 1-10 minutes with pulses of compressed air at pressures of 5-6 bar, with pulse duration of 0.1 –0.2 seconds.

4.6 Air bleeding assembly

- A temperature monitored automatic “Air bleeding ” arrangement avoids exposure of bags to higher temperatures and ensures longer bag life.

4.7 Magnehelic Gauge

- The Magnehelic gauge which measures the pressure differential between the clean and dirty sides of the bags and indicates when they need to be replaced, has recently been refitted to the bag filter. The Magnehelic gauge uses magnetic coupling from the movement of a silicon rubber diaphragm onto a helical pointer drive shaft. This measurement is friction free, accurate at very low differential pressures, and resistant to shock and vibration. Pressure connections are duplicated on rear and side of the unit. The accuracy is to within 2% of the full scale.

4.8 Sealing System

- Aertec Filtration Ltd. installed a snap-around sealing system. The system consists of a gasket built into the plastic collar at the top of each bag and a mating flange built into the filter housing collar ring. During operations, the bag is placed over the housing collar ring and locked into position with light hand pressure. The positive sealing gasket eliminates filter by passing.

4.9 Air Velocity

- The velocity which gives the maximum efficiency is achieved between 14-22 m/s.

5.0 Inspection and Maintenance Programme

A typical program consists of a schedule for periodic inspections that are performed on a daily, weekly, monthly, semi-annual and annual basis. Included in Appendix B of this document is a "*Bag Filter Inspection Checklist*".

5.1 Visible Emissions

- A **visual inspection of the exhaust** from a dust collector should be performed **daily** and recorded in the Inspection Checklist. If no dust is visible an "N" is to be recorded, if dust is visible a "Y" is to be recorded.
- Any particulate seen discharging from the exhaust stack is considered visible emissions.
- Emissions of smoke or dust is an indication of bag problems. The leak must be found and corrected immediately
Check filter bags to ensure they are securely attached to the tubesheet, check seals.
Check filter bags for rips, tears, or holes along entire length.
- Damaged bags should be replaced immediately as they will damage other bags and may cause damage to fan bearings due to internal loading.
- Emissions can lead to breaches of licence limits, are a health concern, can cause damage to property outside the plant and may lead to enforcement actions by regulatory bodies.

5.2 Hopper Discharge:

- The **hopper should be inspected and emptied daily** and a "Y" recorded for being complete on the "*Bag Filter Inspection Checklist*". The dust from the hopper is emptied into 220 litre blue plastic drums suitable for hazardous waste collection.
- The hopper is the section of a dust collector located below the filter bag housing utilized for the accumulation and discharge of the collected dust.
- The hopper on a baghouse is not to be used for the long term storage of the collected dust. Storing material in a hopper can lead to bridging of the dust forming a solid mass requiring considerable labour and down time to correct. The dust can back up in the hopper and into the dust collector thus damaging the filters. Also it can create a dangerous situation where dust could ignite inside the dust collector

5.3 **Magnehelic Gauge (Differential Pressure)**

- **Record the differential pressure (pressure drop) reading on the magnehelic gauge daily** and document reading on the “*Bag Filter Inspection Checklist*”. During normal operation the gauge should usually read a value between 1 and 6 inches of water pressure differential (between 0 and 250 mm of water pressure differential).
- **Monthly blow out (clear) the magnehelic lines** to prevent possible blockages and record a tick as being complete on the “*Bag Filter Inspection Checklist*”.
- **Annually the magnehelic gauge is recommended to be calibrated**. Record a tick as being complete on the “*Bag Filter Inspection Checklist*”.
- Differential pressure or pressure drop is the difference in pressure between the dirty and clean air sides of the collector. New filter bags have the lowest differential pressure. As the bags develop a dust cake some particulate will embed themselves onto the filter and the pressure drop will increase accordingly. It is the filtering of the airstream through this accumulated dust cake that provides high efficiency collection of fine particulate.
- Post a bag filter change if the tolerance of between 1 and 6 inches of water pressure differential cannot be maintained then adjust the cleaning cycle on the timer.

To reduce differential pressure, adjust time delay so that cleaning pulses occur at a more frequent rate (shorter OFF time). To increase differential pressure that is on the low side, adjust time delay so that cleaning pulses occur at a less frequent rate (longer OFF time).
- Following an initial seasoning or conditioning period of filter bags, the pressure drop should stabilize into a consistent operating range.
- By monitoring differential pressure regularly any deviations from historical readings will alert an operator to investigate the cause of the occurrence.
- High differential pressures can cause bleed thru or blinding of the filter media.

- High differential pressures can indicate;
 - the filters need to be replaced.
 - the magnetohelic gauge tubing could be blocked.
 - the hopper is blocked with material. If the hopper is full of material shut down the equipment and remove the material through the discharge opening.
 - that ductwork is blocked with material
 - the cleaning system is not functioning properly
- Low differential pressures can indicate for the operator to;
 - Check filter bags to ensure they are securely attached to the tubesheet, check seals.
 - Check filter bags for rips, tears, or holes along entire length.

5.4 Filter Media:

- **Weekly inspect the clean air side of the baghouse for leaks and the bags for tears** and record a tick as being complete on the “*Bag Filter Inspection Checklist*”.
- The most important item in a baghouse is the filter media because it allows for the accumulation and support of a dust cake. This dust cake is what provides high filtering efficiencies during operation.
- **Every six months inspect the bag condition of the dirty side** and record a tick as being complete on the “*Bag Filter Inspection Checklist*”.
- If excessive dust cake is evident when visually inspecting the filter bags the cleaning system may not be functioning properly. If the dust cake has hardened to the bags and will not dislodge easily the cause could be moisture in the baghouse. Moisture in a dust collector may have resulted from high moisture content in the process gas, in the compressed air supply, or a leak in the collector or ductwork that allowed water to enter the dust collector.
- **Replace the filter bags yearly** and record as being complete on the “*Bag Filter Inspection Checklist*”.

5.5 Exhaust Fan:

- **Daily observe the fan for any unusual vibration, squealing, or other obvious variances from standard operation** and record an “N ” for No or a “Y ” for “Yes ” on the “*Bag Filter Inspection Checklist* ”.
- **Thorough fan inspections are to be performed on a semi-annual basis** and record a tick as being complete on the “*Bag Filter Inspection Checklist* ”. Check for corrosion, blade wear, drive components, belt tension, etc.
- In a dust collection system, an exhaust fan is needed to accelerate ventilation air from the point of pick-up, through the ductwork and baghouse filter media, and out the exhaust stack. Should an exhaust fan experience loose or worn belts or an imbalanced impeller, it will not exhaust the volume of air it was originally designed to handle. Without adequate ventilation air, a dust collection system will not operate effectively.

5.6 Cleaning System

- **Weekly inspections** are to be recorded as being complete with a tick on the “*Bag Filter Inspection Checklist* ” and include;
 - Is the **compressed air system** in order? **Check for air leakage (low pressure) and check water traps**. Ensure that 90-110 psi pressure is available at the collector.
 - **Are solenoids operating?**
 - **Are diaphragm valves firing?**
- **Monthly inspections** are to be recorded as being complete with a tick on the “*Bag Filter Inspection Checklist* ” and include;
 - **Check the compressed air lines, including line oilers and filters.**
 - **Are all hoses and clamps in order?**
- Pulse jet air bag filters use compressed air (90-110 psi) to clean their filters which removes dust from the filters to keep them working well. If the compressed air pressure is too low the pulse jet cleaning system can't clean the filters efficiently.

- Diaphragm and solenoid valves control the pulses of compressed air that clean the filters. These valves can become damaged or leak which will cause a loss of compressed air and reduced cleaning of the filters. When the cleaning system pulses check all the valves work at the same time. Make sure that the valves open all the way and close all the way. Check that all hoses are attached and inspect them for leaks
- Without an effective cleaning system dust will continue to build on the bags. The result will be an increased pressure drop and a reduced volume of air being passed through the system. Airstream velocities within the ductwork will decrease and cause drop out of dust in the ducts which may choke the entire system and render it ineffective.

5.7 Seals and Gaskets

- **Quarterly inspections** are to be recorded as being complete with a tick on the “*Bag Filter Inspection Checklist*” and include;
 - **Are there leaks in access doors?**
 - **Check gaskets on all doors and ducts.**
- Dust collector doors have a seal that keeps air and dust inside. The gasket around the edges of the door can become worn out or cracked. If this happens the door will not seal properly.

Open the dust collector doors and inspect the gaskets. If they appear damaged they should be replaced. Air leaks can allow dust to escape and can prevent the system from moving air properly.

5.8 Structural Integrity:

- **Annual inspections** are to be recorded as being complete with a tick on the “*Bag Filter Inspection Checklist*” and include;
 - **Check the structural support members for signs of fatigue and excessive corrosion**
 - **Inspect the welds, joints and flange seals.**
 - **Be certain that all fasteners are in place and tightly secured, especially on the ladder and access platform**
 - Replace any missing bolts, clean and re-weld any cross bracing or gussets that may have cracked welds
 - Look closely at the filters external walls for corrosion or signs of bowing.
 - Clean and repaint where necessary
 - Repair any holes that may have developed in the dust collector walls or hopper.
- The structural integrity of the equipment can not only affect its performance but cause health and housekeeping concerns and reduced equipment life. Any leaks in the collector must be sealed either mechanically or by using silicone caulking. In a positive pressure system dust will blow out of the collector causing housekeeping problems and a potential health hazard to employees exposed to the dust.

5.9 Ductwork

- **Annual inspections** include are to be ticked as being complete on the “*Bag Filter Inspection Checklist*” and include;
 - **Check ductwork for a build-up of dust.**
- It is advisable to periodically inspect the entire length of ductwork for dust accumulation. Standard practices suggest a minimum airstream velocity within any duct of 18m/s (3500 feet per minute). Should the dust travel at lower than adequate velocities it will tend to settle and accumulate in the ducts choking the system. This restriction of flow will increase the pressure drop in the system and the energy required to induce the air to move. The resultant will be reduced ventilation air at the pickup point.

5.10 Monitoring of Emissions to Atmosphere

- **Monitoring of emissions to atmosphere is to be performed annually.** Record a tick as being complete on the “*Bag Filter Inspection Checklist*”.
- Monitoring of emissions to atmosphere is to be performed by an ISO17025 certified contractor.
- The Emission Limit Values are set out in Schedule 1(i) Monitoring of Emissions to Atmosphere of the Industrial Emissions Licence (IEL) of number P0385-01 and are as follows;

Schedule 1(i) Emissions to Atmosphere

Emission Point Reference No.: 1 (Pot Enclosure Exhaust)

Location : Overhead Control Room

Volume to be emitted: Maximum in any one day : 175,000 m³

Volume to be emitted: Maximum rate per hour : 10,500 m³

Minimum discharge height: 12 m above ground

Parameter	Emission Limit Value (mg/m ³) from September 1 st , 2000
Zinc	5
Particulate matter	10
Lead	2
Cadmium	0.5
Chlorides (as HCl)	30

- Monitoring and analyses of each emission shall be carried out as specified in Schedule 1(ii) Monitoring of Emissions to Atmosphere of the Industrial Emissions Licence (IEL) of number P0385-01.

Schedule 1(ii) Monitoring of Emissions to Atmosphere

Emission Point Reference No.: 1 (Pot Enclosure Exhaust)

Parameter	Monitoring Frequency	Analysis Method/Technique
Particulate matter	Continuous	Continuous particulate monitor
Zinc	Quarterly	AA/ICP
Lead	Biannually	AA/ICP
Cadmium	Biannually	AA/ICP
Chloride (as HCl)	Biannually	To be agreed with the Agency
Ammonia	Biannually	To be agreed with the Agency

- The frequency of monitoring is annually for parameters Zinc, Lead, Cadmium, Chloride (as HCl) and Ammonia, as agreed and approved by the Agency on the 13-Feb-2014 in accordance with Condition 10.5 of IEL Reg. No. P0385-01, under the approved submission request of number LR007712. A screenshot of the approved submission request of number LR007712 is included in Appendix C of this document.

6.0 Compliance Record

As observed with annual monitoring programmes the level of particulates, HCl and heavy metals from the bag filter are within the emission limit values specified by the licence, therefore it can be said that Galco Waterford Ltd. have an efficient and effective system for ensuring a high level of IPC licence compliance.

Appendix A: Images

Image of Bag Filter Unit



Image of Bag Filter Emission Point



Image of Magnehelic Gauge



Appendix B: Bag Filter Inspection Checklist

Galco Waterford Ltd. edieu Road, Waterford		Bag Filter Inspection Checklist				
Date:						
Time:						
Inspector (Initials):						
Daily	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N
Any abnormal visual and audible conditions (e.g. with fans)						
Any visible dust being emitted from the exhaust						
Record Diff Pressure (kPa) on manometer. (Note deviations from historical readings) (Should read 25.4 – 152.4 mm H ₂ O)	mm	mm	mm	mm	mm	mm
Dust removed from the hopper daily.						
Is the Hopper discharge device operating correctly?						
Weekly	✓	✓	✓	✓	✓	✓
Inspect clean air side of baghouse for leaks and bags for tears						
Check for signs of air leakage in the compressed air system						
Are solenoids operating						
Are diaphragm valves firing						
Monthly	✓	✓	✓	✓	✓	✓
Blow out (clear) the magnahelic lines.						
Check the compressed air lines, including line oilers and filters, Check all hoses and clamps						
Quarterly	✓	✓	✓	✓	✓	✓
Check gaskets on all doors and ducts.						
Semi-Annually	✓	✓	✓	✓	✓	✓
Inspect the bag condition of the dirty side						
Thorough fan inspection. Check belt tension, corrosion, blade wear, drive components, etc						
Annually	✓	✓	✓	✓	✓	✓
Check the baghouse housing and structural support members for signs of fatigue and excessive corrosion						
Check all bolts and welds and all fasteners are in place & tightly secured, especially on the ladder and access platform						
Check ductwork for build up of dust.						
Replace Filters yearly						
Calibration of Magnehelic Gauge						
Stack emissions monitoring performed						
Notes/Comments						

Appendix C: Approved Request LR007712 - Reduction of Frequency in Monitoring Emissions to Atmosphere

Licensing Notice Details



[Eden](#) >> [All Licences](#) >> [Galco \(Waterford\) Limited \(P0385-01\)](#) >> [All Actions & Notices](#) >>

LS Approval - Notice - Amend Monitoring Approval

Subject

LS Approval - Notice - Amend Monitoring Approval

Created Date

13/02/2014

Dear Kevin Lynchehaun,

I refer to your submission LR007712, "Reduction of Frequency of Emissions to Atmosphere" in relation to reducing the frequency of monitoring of emissions to atmosphere from your bag filter unit - emission point reference no: 1 (pot enclosure exhaust) as referred in the IEL Reg. No. P0385-01, and referred to as A2-1 in your correspondence.

The approval is sought under Condition 10.5 of IEL P0385-01. for an alteration to the frequency of monitoring.

In reference to the above the Agency makes the following comment.

- Monitoring point A2-1 is referred to in your submission, however, the emissions to atmosphere monitoring point in your licence is referred to as "1 (Pot Enclosure Exhaust)".

I am to advise you that on the basis of the information provided, the Agency approves your request. The Agency approves the following changes:

- For Schedule 1(ii) Monitoring of Emissions to Atmosphere, you may amend the frequency from quarterly to annually for Zinc and Particulate Matter at emission point reference "1 (Pot Enclosure Exhaust)".
- For Schedule 1(ii) Monitoring of Emissions to Atmosphere, you may amend the frequency from biannually to annually for Lead, Cadmium, Chloride (as HCl); and Ammonia at emission point reference "1 (Pot Enclosure Exhaust)".

The amendments to frequency of monitoring as detailed above are agreed by the Agency in accordance with Condition 10.5 of IEL Reg. No. P0385-01. The Agency may revoke this agreement at any time, following assessment of unfavourable monitoring results. The licensee should also keep the amended monitoring frequencies under review and revert if necessary.

The licensee is reminded to report any ELV breaches to the Agency as an incident on ALDER, as per Condition 4.1 of your licence.

You are also reminded of the requirement to comply with the Conditions of IEL P0385-01 at all times.

If you have any queries in relation to this please contact the undersigned or a member of Licence Enforcement, Team B, Wexford on 053 9160600.

Yours sincerely,

Eimear O'Keeffe

Inspector, Licence Enforcement,

Team B, Wexford

053 9160600