



Archer Daniels Midland Company OILSEEDS EMEA			TZ2/ERITH WORK INSTRUCTION	
TZ2_EXP_WI Biofilter Odour Abatement			Reference No.	28924
Document Owner SAKKARIN PAKDEE	Version 1	PAGE 1 of 9	Issue Date	2019-10-28
			Last Review	2022-01-24

1 Purpose & Scope

1.1 Purpose

To reduce the potential for odorous emissions to impact the local environment beyond the installation boundary ADM Erith has installed a Biofilter system to treat air emissions from the Dryer Cooler (DC).

This work instruction (WI) details how the Bio filtration system works and describes the operating parameters and provides sufficient information to start/stop the Bio filtration system in a safe manner. The WI also provide guidelines for fault finding.

1.2 Scope

Air emissions from the DC through the Biofilters (Biobeds) and emitted through A14 stack.

2 Responsibility

The following personnel have responsibility for the Biobeds:

- Extraction Operator,
- Shift Superintendent,
- Extraction Process Engineer,
- Extraction Manager, and
- Environment Manager

3 Terms and Definitions

Term	Definition
Biobeds	
Biofilters	
DC	
dTDC	
PT	Policy Tech
WI	Work Instructions
Work Instruction	A document describing a task, step by step. Usually applicable to a single function.

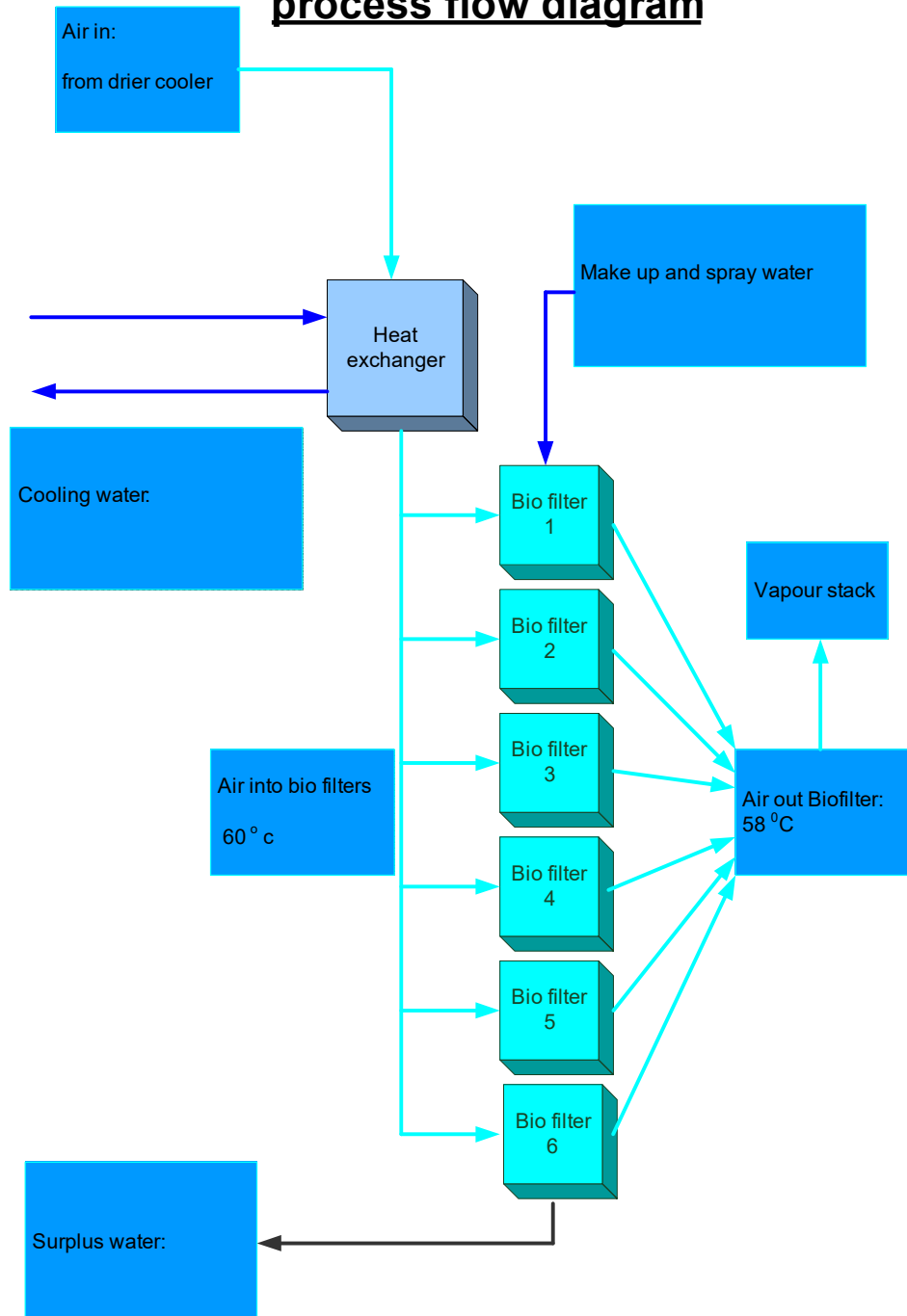
4 Work Instructions



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4.1 Biofilter Process Flow Diagram

ADM Erith Bio filter process flow diagram





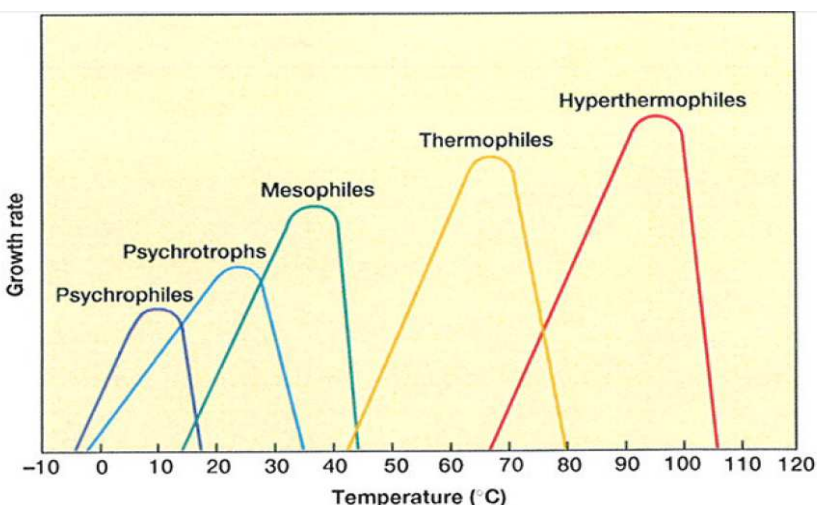
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4.2 Overview

The Bio filtration system is a type of Odour Abatement System that uses microorganisms to remove air pollution.

It is known that odour in air can be treated by Bacteria; the most commonly used in air treatment system are Mesophiles or Thermophiles. Mesophiles work (best) within the temperature range of 20 – 30 °C and Thermophiles within a temperature range of 55 – 65 °C (please, see Figure 1 below).

Figure 1 - Temperature Ranges for Microbial Growth



The bio filter system at ADM Erith is designed to run with higher temperatures thus Erith bio filters will work under thermophile conditions.

4.3 System description

Forced air from the four dry cooler decks of the DTDC travels through the DTDC dust cyclone and then to the vent stack.

When the bio filter system is operational the vent stack diverter flap will be shut. This will direct all of the air flow to the vapour scrubber. This vapour scrubber is designed to remove any particulate that the dust cyclones have not removed. This is to protect the vapour cooler from fouling and also from blocking the bio filters with product.

This is achieved by spraying recycled effluent water (pump 71P05) into the air stream to knock out any particulate; this flow is then returned from the bottom of vapour scrubber to the effluent stream.

The air stream travels from the vapour scrubber to the cooler where cooling water from the extraction cooling tower is used to cool the air stream to an acceptable temperature.



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A fan (31FAN01) is then used to force the air stream into the bottom of the six bio filters via the ducting system, inlet valves are located at the inlet of each filter and can be used to balance the flow between units.

Each bio filter has two filter bed sections upper and lower, the air is fed in below the lower section and then passes up through the lower filter and then through the upper layer of filter.

The treated air stream is then fed through the duct system back the vent stack and to atmosphere.

As the air stream passes through the filter sections the thermophile bacteria on the filter media in our case coconut fibre remove the smell compounds.

To keep the environment inside the filters suitable for the bacteria to grow and survive, water is sprayed onto each filter section on a daily basis using a system of automatic valves and distribution piping.

The water enters the biomass via the Water Control Panel through 14 spray nozzles located in each top and bottom layer of the filters. Approximately 150ltrs of water per day for each filter layer.

Surplus water from the filters is collected and piped into sump where the PH is continuously measured. It is then pumped from the sump to the waste water treatment plant DAF unit.

4.4 Operating the bio filter system

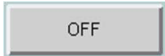
4.4.1 To start the bio filtration system

- Insure the vapour scrubber wash supply pump 71P05 is running and a sufficient flow rate 2-3 m3 per hour is established via the spray nozzles.
- Check the water flow on the outlet drain of the scrubber to insure it is not blocked.
- Insure the temperature control for the heat exchanger is in AUTO with a set point of 600C.
- Insure the BIO BED sequence is running (BIO BED indicator must be green)



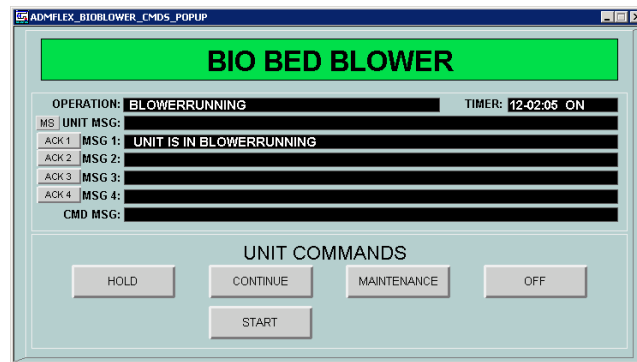
- Start the BIO BED BLOWER SEQUENCE
 - Click on the BIO BED BLOWER sequence indicator




- Click the  button if the sequence is in MAINTENANCE state

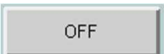

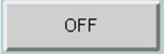



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- Click the  button to start the sequence if it is in OFF state
- Shut the stack damper, note the fan must be running before the stack damper is shut.
- If the fan stops during normal operation the stack damper must be opened immediately.

4.4.2 Stopping the bio filter system DTDC fan running,

- Open the stack damper
 - Turn off the BIO BED BLOWER by clicking the  button
 - Put sequence into MAINTENANCE by clicking the  button
- Stopping the bio filter system DTDC fan off,
- Turn off the BIO BED BLOWER by clicking the  button
 - Put sequence into MAINTENANCE by clicking the  button

The bio filter fan must be running before the DTDC fan is started if the stack damper is closed.

4.4.3 Operation of the SPRAYING sequence

The BIO BED sequence must be running at all time in order to spray the bio bed filters. The sequence indicator is green in the running state.





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The sequence sprays each filter for 3 minutes at the following times of the day.

FILTER #	Time
1	08.00 am
2	11.00 am
3	02.00 pm
4	05.00 pm
5	08.00 pm
6	11.00 pm

Each filter has an indication device on the D/3 graphic. It can indicate the following states:



NO SPRAY indicates that the bio bed filter was not sprayed during this day



SPRAYED indicates that the bio bed filter was successfully sprayed



ALARM indicates that the bio bed filter was due to be sprayed but no flow was measured

All indicators are reset to NO SPRAY every morning at 07.55 am before the first spray cycle.

4.5 System operating parameters

4.5.1 Pressure

Pressure transmitters 31PT10, 31PT11 and 31PT12 indicate the pressure drop over the heat exchanger (HE-01) and over the bio filters.

The whole system is designed for a maximum of 24 mbar over pressure. This pressure will be monitored by the D3, a high pressure after the Blower will generate an alarm signal.

If a high pressure alarm is activated open the stack damper and inform the shift superintendent.

Pressure indicator gauges located on each filter display the differential pressure across the filters upper and lower sections, this pressure should be between 5 mbar and max 20 mbar.



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If this pressure is exceeds 20 mbar open the stack damper and inform the shift superintendent.

- **Possible causes of over pressure, blocked heat exchanger/blocked bio filters, restricted discharged ducting.**

4.5.2 Temperature,

Temperature gauges 31TT10, 31TT11, 31TT12 and 31TT13 indicate the process air temperature measured at the inlet and outlet of the heat exchanger and inlet and outlet of the bio filters.

The bio filter inlet temperature (31TT12) must not exceed 65°C; a D3 alarm will be generated if this value is reached.

Open the stack damper if this temperature is exceeded and inform the shift superintendent.

- **Possible causes of high temperature, insufficient cooling water to cooler, cooler control not working correctly, cooler blocked. Temperatures above 65°C will be detrimental to the bacteria.**

4.5.3 Bio filter spraying system,

Water pressure at the inlet must be between 3.0 bar and 3.5 bar when the filter supply valves are opened. The inlet pressure is measured by water pressure indicator 31PT13 and is regulated by a pressure control valve in the water cabinet.

The water flow capacity through each set of two layers (controlled by one valve) must be around 6-8 m³/h at a pressure of 3.0-3.5 bar.

This flow is indicated by a flow indication 31FT10,

A high flow alarm is indicated if a water flow is indicated when all supply valves are shut. If this occurs shut off main water valve and inform superintendent.

- **Possible causes** of high water flow are failure of filter supply valve or fault with flow meter.

4.5.4 Drain water

PH meter 31PH10 indicates the PH of the drain water from the bio filters sump. This PH meter must indicate a pH value between 4.5 and 8.0.

- **Possible cause,**
 - Too high pH, the activity of the mass has reduced due to lack of nutrition.
 - Too low pH, Indicates over activity of the biomass.



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4.5.5 Sump high level Alarm

Inform the superintendent, open stack damper and shut down the bio filter fan, failure to do this may result in the overflow of the sump into the surface water drains. If required change the pump immediately and restart the bio filter system.

▪ **Possible causes,**

- Failure of submersible sump pump, failure of one of the filter water supply valves.

The extraction operator must monitor and record the following bio filter parameters on the Extraction Log Sheet (912-EXT-DOC-001 (Issue 03) - Extraction Log Sheet)

- Heat exchanger temperature, °C;
- Pressure drop across the heat exchanger, mbar;
- Air pressure to the bio filters, mbar;
- Inlet and outlet bio filters temperature, °C;
- pH level of the condensate after the bio filters, pH;

If any of the above parameters cannot be met please use the possible causes notes to attempt to correct any systems defects. If remedial action does not correct the Bio filters function please inform the shift supervisors who must report any defective equipment to the appropriate maintenance department as soon as possible.

In a case of biofilters breakdown the shift supervisor should complete an Environmental incident report form as soon as practical.

5 Required Training

All personnel within this work instruction are required to be familiar with its requirements.

6 Applicable/Referenced Documents

Document (add title and/or abbreviation)	Document source
912-EXT-DOC-001 (Issue 03) - Extraction Log Sheet	
912-EXT-PID-088 – P&ID for Bio filters	



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7 Document Control

Document Approvers:	DAVID HOLLOWAY
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