CoalFlo Damper®

Operations & Maintenance Manual

Version ***<2.0>***

Date *15/11/2016*

The Greenbank Group UK
Incorporating
Greenbank Terotech
Greenbank Materials Handling
GAIM

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VERSION HISTORY

Document is controlled by quality control systems to ISO 9001:2000.

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The Company

Over many years Greenbank has developed a wide variety of specialised services for heavy industry.

Greenbank, in accordance with BS EN ISO 9001:2000, designs, manufactures supplies and installs their own specialised products together with all the associated equipment.

We also offer an ‘on site’ and 'in workshop' repair and maintenance service together with comprehensive range of replacement and spares.

The quality, accuracy and performance of the Company’s products result from over 50 years’ experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

Greenbank offers a full range of services from the small unit sale of AD3 pipe repair putty to a complete turnkey ash and dust handling system.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information

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DISCLOSURE

Greenbank Terotech Ltd. makes no warranty of any kind, expressed or implied, with regard to the diagrams or the documentation contained in this manual. Greenbank Terotech Ltd. shall not be liable in any event for incidental or consequential damages in connection with, or arising out of, the furnishing, performance, or use of these diagrams.

Information in this document is subject to change without notice and does not represent a commitment on the part of Greenbank Terotech Ltd.

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1 Introduction

1.1 Purpose

The CoalFlo® is designed to improve PF distribution from milling plants, where distribution can be effected by the pressure drop differences across connected outlets.

Balancing the flow of pulverised coal and biomass fuels (PF) from multi-outlet mill classifiers is generally hindered by differing pressure drops across the multiple pipelines which convey PF to the burners. As each pipeline takes a different route to the boiler and connects to a different burner, it is inevitable that some pipelines will be longer than others and some will have more complex changes in direction.

Assuming the mill and classifier are performing well and the piping system is well maintained, the air and finer PF particulates will take the easiest route out of the classifier, this being the pipeline with the least resistance. Furthermore, changes to the load line, fuel type and particle size, plus deterioration (wear and tear) of the piping system, valves, milling and classification plant, can each affect the pressure drop in any particular pipeline. As pressure drop is therefore dynamic, it is necessary to provide some form of adjustable orifice which compensates for the differences in individual pipelines and any subsequent changes or variation to pressure drops.

Figure 1.1- CoalFlo® with actuator

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1.2 Audience

This document is provided for system installers, maintenance engineers and operators.

2 System Description

2.1 System Technical specifications

General	
Design/ Engineering	**Size Range:** 6” through 60” 150mm through 1525mm **Working Pressure:** 7.25psi 48kPa **Design Pressure:** 50psi (200psi min yield) 1379kPa (345kPa min yield) **General Design:** NFPA8503 GDCD 215 **Flange Designs:** DN200_DN1600 Certified Carbon BS EN/ANSI/ASME/API/DIN/JIS Bespoke Design **Bearings/Seals:** Labyrinth Seals Stainless Steel Self Aligning Seal **Actuation (options):** Manual Lever Air Cylinders Hydraulic Cylinders + Positioner Electric Motor
Materials of Construction	**Damper Body:** Certified Carbon Steel Body **Damper Linings (from):** Zalcon, Alumina Zirconium Casting Alumina Cast Basalt White Cast Iron **Damper Vanes (from):** White Cast Iron Zalcon, Alumina Zirconium Casting

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3 Product Installation

3.1 Typical Retro fit installation

Installation of the CoalFlo® is bespoke to each PF conveying line. The generic procedure for installation is to cut a section of pipe post the mill outlet to allow insertion of the CoalFlo® damper. Larger flanges are required to connect to the CoalFlo®.

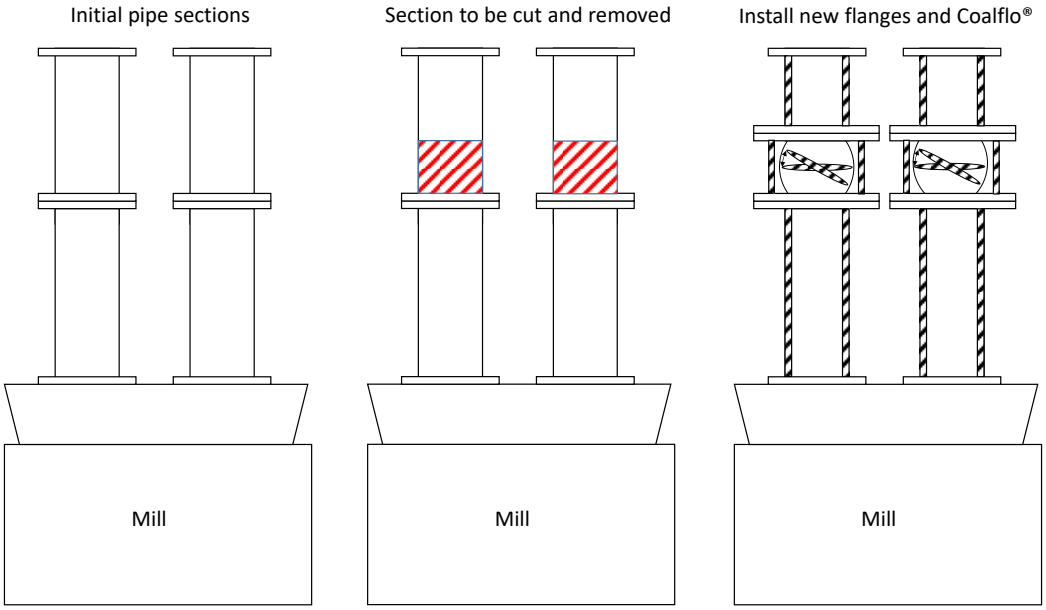

Figure 3.1 – Typical CoalFlo® installation

CoalFlo® installation will be indicated by the Greenbank supplied installation drawings.

Any other methods of installation will be provided by Greenbank Engineers in the installation drawings.

3.2 CoalFlo®

Operation of the CoalFlo® should be positioned such that it can be adjusted whilst in situ. Each operating lever can be adjusted up to 90° from the pre-set factory setting (centre, 0).

3.2.1 Operating the CoalFlo® manually

The operating lever is adjusted as follows:

1. Using a M16 spanner, loosen the locking mechanism at the measuring gauge.
2. Adjust the operating lever by turning the handle in a rotational direction either to the left or the right depending on how the distribution needs balancing.

3. Check the degree of movement on the gauge via the marker and hold in position
4. Lock the nut in position.

3.2.2 Operating the CoalFlo® Pneumatically

1. Check that CoalFlo® valve is fitted with an actuator.
2. Ensure CoalFlo® is wired into your designed EC&I system.
3. Ensure your EC&I system is calibrated so the setting used has the desired movement effect on the CoalFlo® blade.
4. Operate CoalFlo® as desired.

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3.3 Maintenance

The CoalFlo® are fully lined, so that they will resist erosion. It is important when moving pipe work and during maintenance to make sure the CoalFlo® is returned to its prescribed orientation.

Once the optimum CoalFlo® positions have been set during commissioning, the CoalFlo® will not require movement unless a particular bias is required for testing or the operating conditions originally set are altered.

Seizing of the CoalFlo® may occur over time. Do not apply a shock based force such as a hammer to free it. Greenbank recommends that a good quality releasing agent is used. A large shock force can detach the central pivot from the blades. A steadily increasing load should be used.

Inspect the CoalFlo® for any damage or wear annually using a flexible camera by placing it through an appropriate port downstream of the CoalFlo®. Push the flexible camera to the area that requires inspection.

For more vigorous inspection remove the CoalFlo® from the pipe network using planned site and health and safety procedures and manually inspect.

CoalFlo® technology uses intrusive blades within the flow to impart a dynamically adjustable pressure drop to the flow. The blade is therefore subject to wear and although Greenbank select the optimum material to meet the station needs the wear cannot be eradicated and may be affected by changes in loads and fuel types.

Changes in load, fuel types and fuel quality may affect the performance of the CoalFlo®. Any significant changes may require the CoalFlo® to be re calibrated to meet the new flow criteria. The client should re-calibrate the CoalFlo® annually (follow commissioning procedure) to ensure optimum distribution is obtained.

Users should determine the distribution of fuel mass flow on an annual basis to ensure optimal performance of the CoalFlo®. The user should inspect the fuel distribution on an annual basis using ISO-9931 sampling methodology and if necessary adjust the CoalFlo to optimise the distribution. Sampling should be repeated to confirm the blade movement. Greenbank can also perform this service please contact Greenbank for more information.

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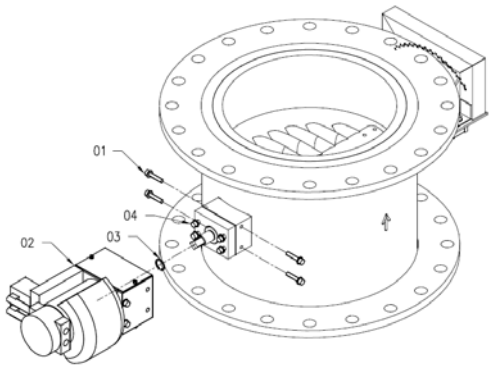
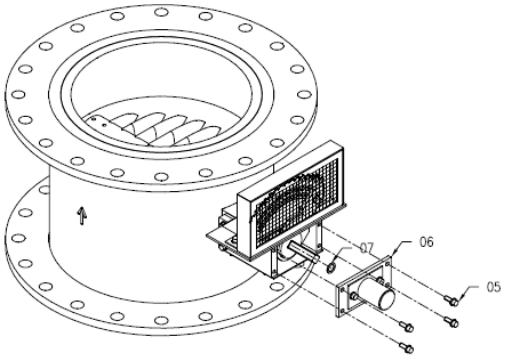
3.3.1 Replacing CoalFlo® blades



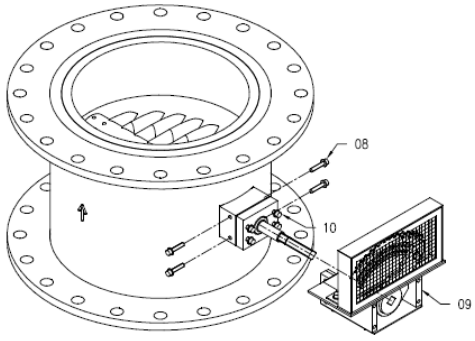
[ISOMETRIC VIEW – ACTUATOR END]

STEP 01 – REMOVE 4No FASTENERS.
STEP 02 – REMOVE ASSEMBLED ACTUATOR BLOCK.
STEP 03 – REMOVE CIRCLIP.
STEP 04 – LOOSEN BOLTS.



[ISOMETRIC VIEW – INDICATOR END]

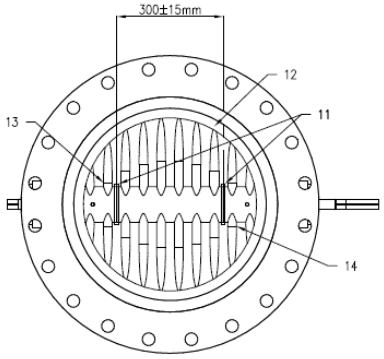
STEP 05 – REMOVE 4No FASTENERS.
STEP 06 – REMOVE ASSEMBLED PLATE/GUARD.
STEP 07 – REMOVE CIRCLIP.



[INDICATOR END]

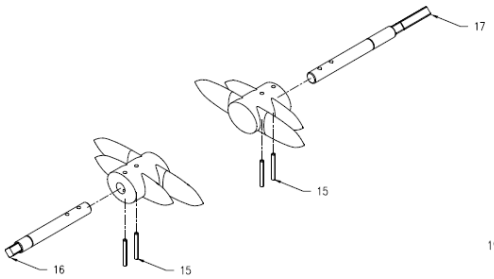
STEP 08 – REMOVE 4No FASTENERS.
STEP 09 – REMOVE ASSEMBLED INDICATOR/GUARD.
STEP 10 – LOOSEN BOLTS.

ADD ARROWS



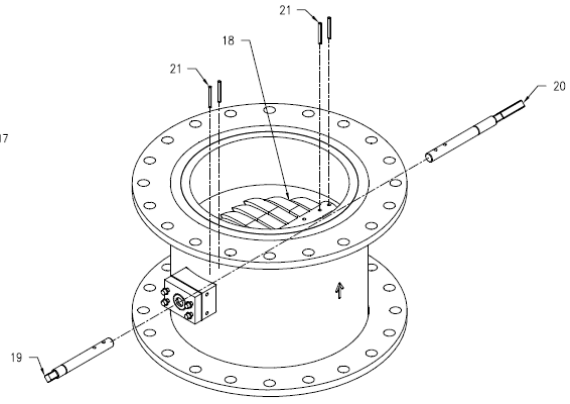
[PLAN VIEW]

STEP 11 – CUT THROUGH EXISTING FLAP AT 2 POSITIONS.
STEP 12 – DISCARD CENTRAL PIECE OF EXISTING CUT FLAP.
STEP 13 – REMOVE EXISTING CUT FLAP AND ACTUATOR END SHAFT FROM VALVE.
STEP 14 – REMOVE EXISTING CUT FLAP AND INDICATOR END SHAFT FROM VALVE.



[ISOMETRIC VIEW]

STEP 15 – REMOVE 4No PINS.
STEP 16 – REMOVE ACTUATOR END SHAFT. DISCARD EXISTING CUT FLAP.
STEP 17 – REMOVE INDICATOR END SHAFT. DISCARD EXISTING CUT FLAP.



[ISOMETRIC VIEW]

STEP 18 – INSTALL NEW FLAP ENSURING CORRECT ORIENTATION.
STEP 19 – INSERT ACTUATOR END SHAFT INTO VALVE AND FLAP.
STEP 20 – INSERT INDICATOR END SHAFT INTO VALVE AND FLAP.
STEP 21 – INSERT 4No PINS INTO FLAP AND SHAFTS AND RE–GROUT ENDS

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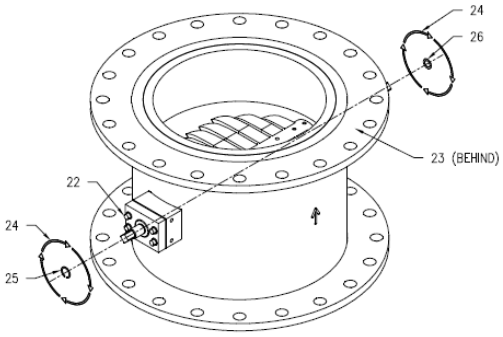
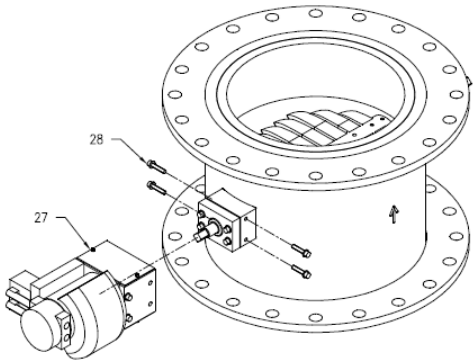


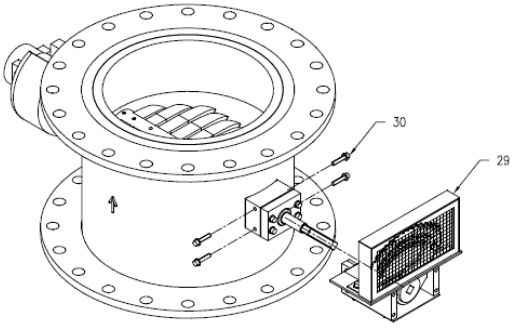
[ISOMETRIC VIEW]

STEP 22 – RE–TIGHTEN 4No SCREWS ON ACTUATOR SIDE.
STEP 23 – RE–TIGHTEN 4No SCREWS ON INDICATOR SIDE.
STEP 24 – ENSURE BLADE CAN BE SMOOTHLY ROTATED 360°.
ENSURE SHAFT IS ADEQUATELY SEALED.
ADJUST SCREWS IN STEPS 22 & 23 TO SUIT.
STEP 25 – RE–FIT CIRCLIP ON ACTUATOR SIDE.
STEP 26 – RE–FIT CIRCLIP ON INDICATOR SIDE.



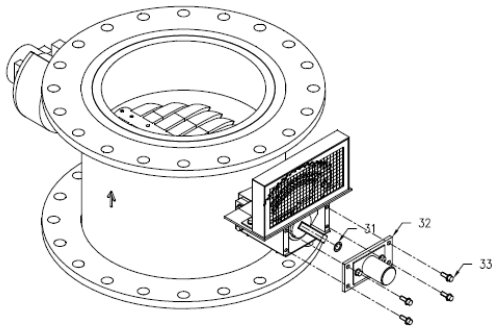
[ISOMETRIC VIEW]

STEP 27 – RE–FIT ACTUATOR ASSEMBLY ONTO SHAFT
STEP 28 – RE–FIT 4No FASTENERS.



[ISOMETRIC VIEW]

STEP 29 – RE–FIT INDICATOR ASSEMBLY ONTO SHAFT
STEP 30 – RE–FIT 4No FASTENERS.



[ISOMETRIC VIEW]

STEP 31 – RE–FIT CIRCLIP.
STEP 32 – RE–FIT ASSEMBLED PLATE/GUARD.
STEP 33 – RE–FIT 4No FASTENERS.

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3.4 Commissioning

3.4.1 Arrival to site & routine

1. Arrive on site and report to contact
2. Escort to Unit with Rotor probe equipment.
3. Prior to commencement of work ensure that all PPE is correct, tools and equipment are suitable.
4. On arrival at job site ensure that we are familiar with all escape routes and assembly point in case of emergency.
5. Read the risk assessment document to ensure that all requirements have been covered and can be met. Add any relevant actions that may become apparent when looking at the job.
6. Make sure the working area is clear and the work won't affect anyone else.

3.4.2 Commencing work requirements

Commissioning will be carried out by qualified Greenbank engineers.

1. The station will need relevant sample ports at suitable locations that comply to the following points:

    a) 2" BSP sample ports are available after the Control Gate™ with reducing bush for dustless connector.
    b) All ports have safe access and egress.
    c) Ports must be in a location as to allow for a 2m probe and must be accessible and there is sufficient lighting.
    d) Electrical and compressed air supplies where required are available. .
    e) The plant is available.
    f) All ports must be on a straight section of vertical pipe after the split and preferably 5 pipe diameters from any pipe bend. If the specified locations are not possible please consult Greenbank for further instructions.

2. Firstly install air lines from the station and provide air to the Rotor probe unit and probes. Minimum requirement of clean oil free compressed air at 6 bar with a steady supply of 10 cfm.

3. PF temp is not greater than 100°C

4. Install power from the station supply and provide power to the Rotor probe unit. This is from a standard C-form port at 110V station supply.

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5. Ensure all CoalFlo® blades are in fully open position.

3.4.3 Commissioning procedure

1. Unscrew sample port stopper, and immediately replace with a dustless connector (with stopper attached to the back of the dustless connector).

2. Attach airline to dustless connector and remove stopper and check the dustless connector is working properly.

3. Place in manometer to calculate differential pressure. Take temperature readings.

4. Calculate the required suction rate.

5. Sample using Rotor probe. Store sample in a sample bottle and weigh the contents.

6. Repeat this process on all lines.

7. If needed remove the lock on the Control Gate™ and adjust the gates to optimise distribution.

8. If gates are moved then re sample.

9. Repeat steps 5-8 until the CoalFlo® are within specification limits. The amount of movement required by the CoalFlo® will be specific to each line and flow conditions.

10. Ensuring that the site is left neat and tidy and free from debris

11. Report to contact before leaving the site.

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3.4.4 Commissioning procedure (Using PFMS technology)

1. Set the mill to the design load as stated in the input parameters of the CFD.
2. Set the control to manual to as not to modulate with boiler conditions.
3. Allow the mill to settle (1 hour) or must be operating stably over time.
4. Use the PFMS system to determine the relative mass split between legs.
5. If needed adjust the CoalFlo® gates to optimise distribution.
6. Monitor the system for stability (1 hour).
7. Repeat points 5 and 6 until values are within specification limits.
8. Put the mill back into auto mode and the load required by the station.
9. Ensure the site is left neat and tidy.
10. Report to contact before leaving site.

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4 Products and customer support

Materials: Cast Basalt, Alumina, Zalcon
Ni-Hard and High Chrome Steel- *Abrasion Resistant Lined Pipework Chutes and Hoppers*
Silicon Carbide - *Abrasion Resistant Lined Pipework*
Performance Steels- *Abrasion Resistant Lined Chutes and Hoppers*
HDPE and MDPE - *Pipework, Chutes and Hoppers*
Anti-Degradation Compounds – *for low to med wear resistance applications.*
Ceramite – *for medium wear resistance applications.*

Applications:
Acid Resistant Products and Cement
Pulverised fuel Pipework and Ancillary Equipment
Flow Dividing Riffles and Splitters
Ash Pipework and Ash Systems
Hoppers, Chutes and Fabrications
Automated Ashing and Handling Systems
Dense Phase Conveying Systems
Dampers and Valves
Mill Classifiers and Exhausters
Specialised Engineering and Lining Services
Heavy Industrial Fabrication

Equipment/Systems:
Material Handling Systems
G-CAM - Carbon-in-Ash On Line Monitor.
ABB - PfMaster PF Mass Flow and Velocity Meter
Particle Size Analysers
GA 202 - Boiler Acoustic Steam Leak Detection System

Customer Support
We provide a comprehensive after sales service. Contact our office for details.

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Client Warranty
Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:
1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of operating and maintenance records relating to the alleged faulty unit.

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.