

# VARB - VARIABLE AREA ROPE BREAKER

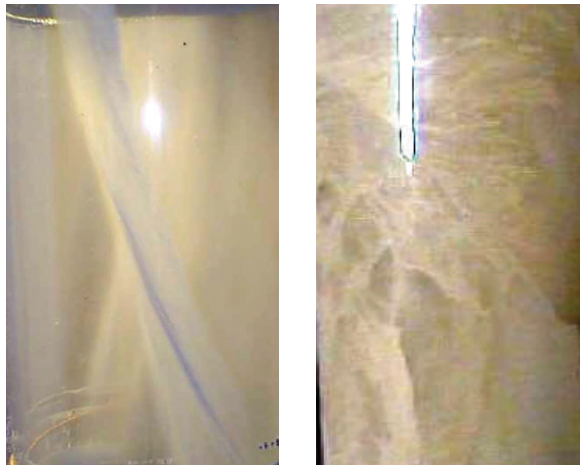
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GREENBANK ENERGY SOLUTIONS INC.  
LIMESTONE APPLICATIONS

Greenbank Energy Solutions Inc, in partnership with Nottingham University and Greenbank Advanced Instrumentation & Measurement (GAIM) in the UK, have developed a suite of technologies for optimizing the distribution of coal and limestone to the burners at coal fired power stations, and limestone feed to the bed of CFB's.

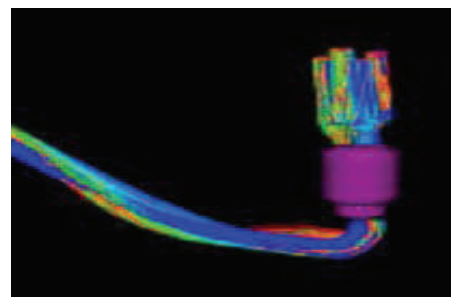
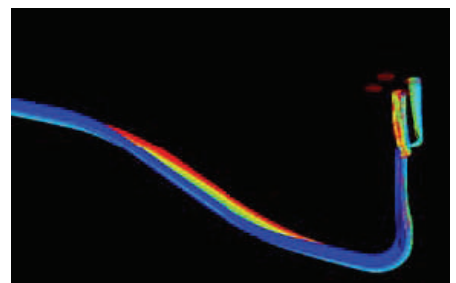
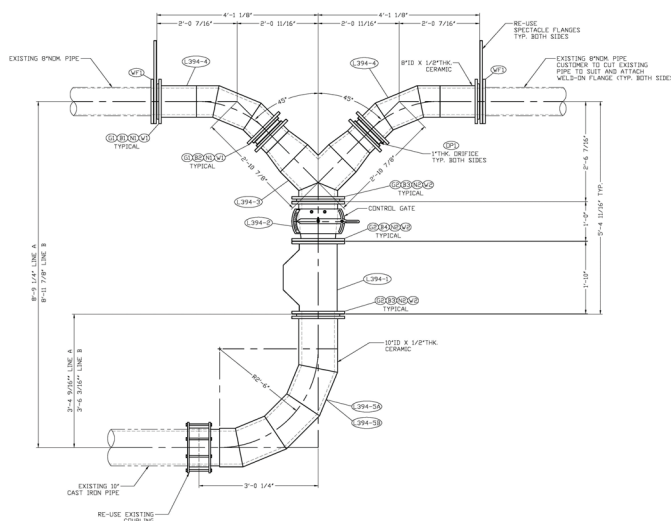
The VARB is a non-intrusive passive device designed to break the material rope, equalize the split of the material at pipe junctions and homogenize material distribution across the pipe, with minimal pressure drop in the pipeline. It is used for a variety of material where metered distribution is required.

The original Variable Area Rope Breaker (VARB) and Venturi-VARB have been proven to give distribution of 50 % +/- 5 % for a 2 way vertical split. The VARB, discovered almost by accident in 2004 through work on development of on-line particle size analyzers, creates enhanced spin of the solids phase allowing a more equal distribution at the 2 way split.



The pictures to the left show the before and after effects of the VARB on the rope. The technology of the VARB is nonintrusive, and uses the effects of pressure differentials due to pipe geometries to create spin. All of our parts are ceramic lined to combat abrasion.

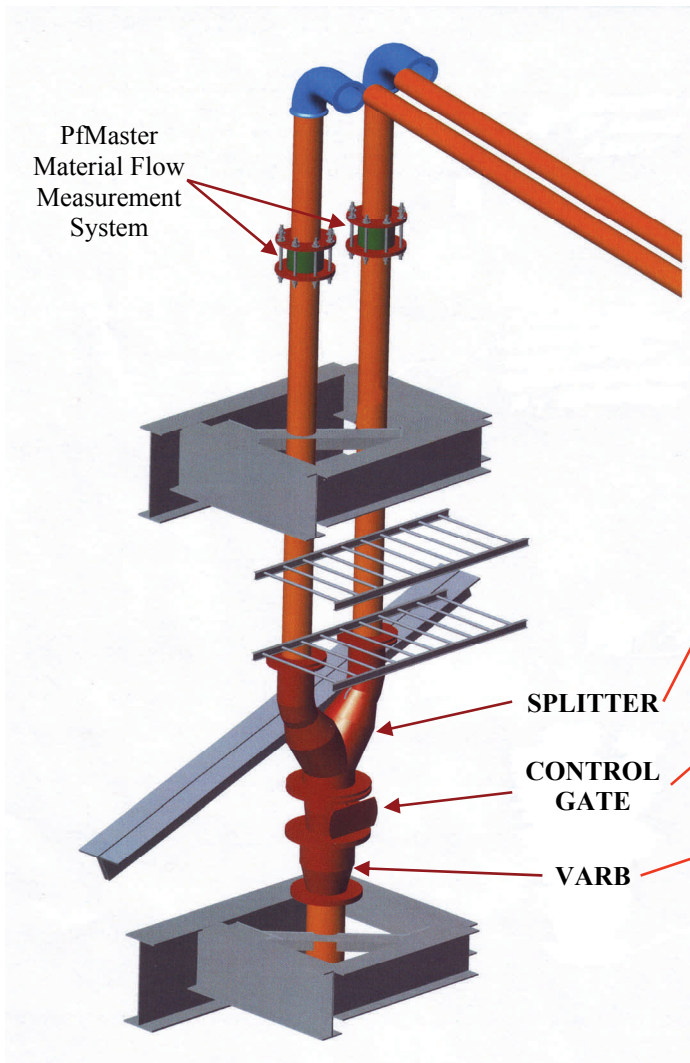
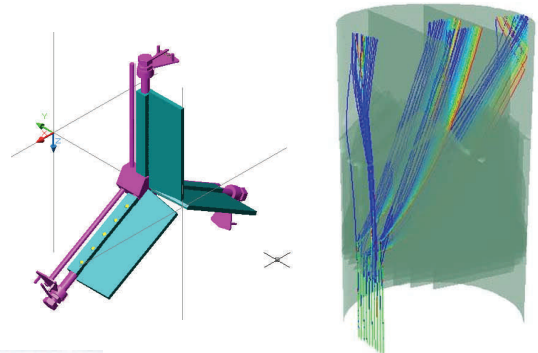
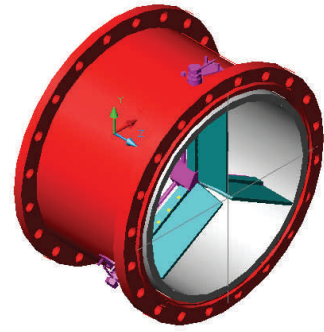
Greenbank employs specialists in particulate analysis and control and offers both CFD analysis and a scaled test rig, where concepts can be brought to life and tested prior to delivery to the customer.



# GREENBANK LIMESTONE CONTROL SYSTEM

The purpose of a VARB diffuser is not only to break the rope and disperse it so that the distribution can be as near perfect as possible, but any small deviations should be repeatable so that a small amount of trimming can be applied.

The control gate is shown in the picture to the right. Material flow is directed into the diverter blades from the right on the picture, so that it is hinged downstream of the flow. The blades do not cover the entire cross section. The intention is to divert some particles and minimize pressure drop. Note, there is a space behind the blades before the split to ensure equal air distribution / pressure down each leg. The device is intended for trimming only, and is available for 2, 3 or 4 way split configurations.



CFB Limestone System with VARB and Control Gate installed

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