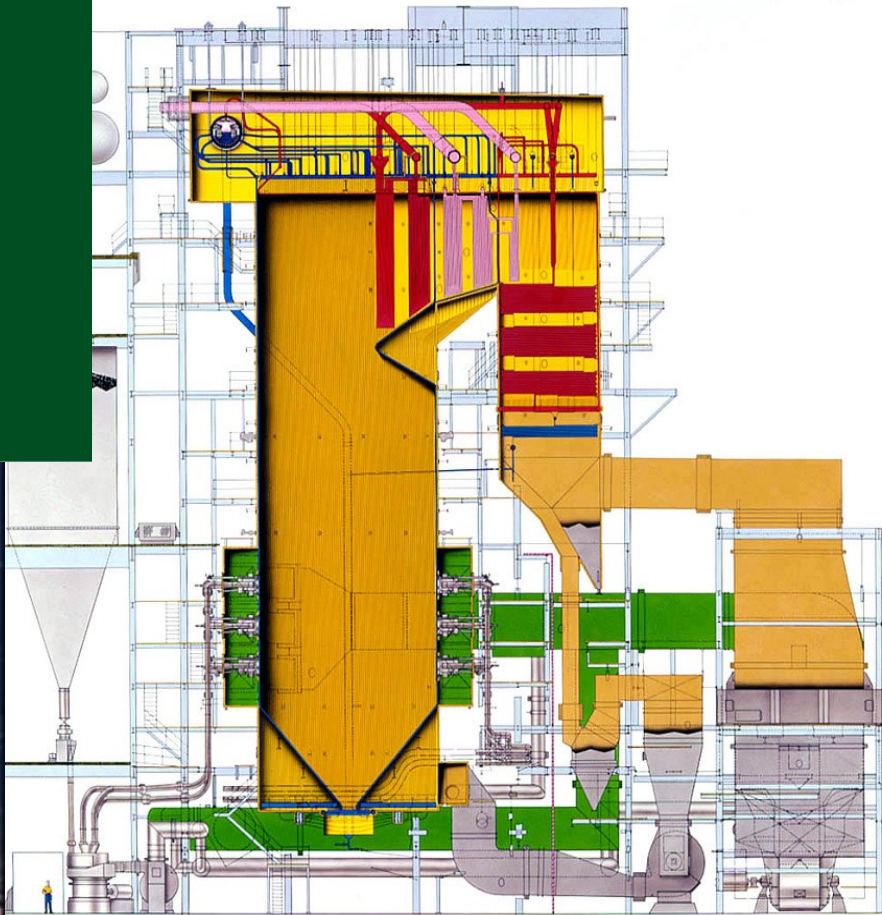# GREENBANK ENERGY SOLUTIONS INC

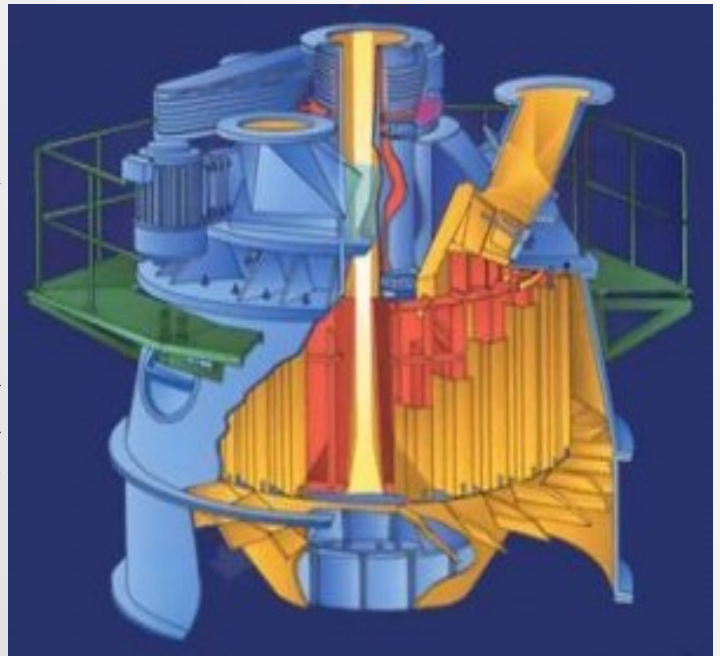# *HEP* *Dynamic Classifiers*

High Efficiency High Performance

Improving Your FDS

Todays economic and regulatory environment has required coal-fired power plant operators to improve performance efficiency and reduce emissions simultaneously. That has typically included installing improved burner and air systems, along with back-end emissions control systems. However, little has been done to improve the fuel delivery system as it relates fuel particle size and fuel/air ratio and balance. Static and "high" performance static classifiers provide less than adequate performance to meet new and changing requirements. Adding load-swing the current list of demands, a dynamic classifier is the only effective solution to improving mill performance and combustion efficiency.

Design Function

The HEP Dynamic Classifier is designed to maximize the efficiency of primary air flow through the pulverizer, while minimizing the particle size distribution presented to the burner.

An outer ring of adjustable, vertical classifier louvers and an inner rotating ring of classifier blades serve to control the air/fuel flow out of the mill relative to volume and particle size. The variable rotor speed provides real-time control based on load and combustion characteristics of the fuel as it increases or decreases the particle reject rate. Additional features result in a balanced fuel/air ratio pipe-to-pipe.

The HEP Dynamic Classifier is custom designed for the pulverizer and burner configuration making retrofit installation easy and economical. The HEP is engineered, designed, manufactured, and serviced in the U.S., in compliance with ASME, NFPA, and NEC standards. The low profile design minimizes modifications to the existing static classifier footprint thus reducing installation costs. Adjustments of the operational components are made external to the classifier and can be made while the unit is operating. This provides real-time flexibility to correct for changes in fuel composition or characteristics.

High Efficiency High Performance

HEP Dynamic Classifier Benefits

Increased Boiler Turndown

Improved particle size distribution, together with more even coal distribution to the burners, produces a more stable flame, reducing the boiler load level where the support fuel must be started. Actual operating experience has shown this to be 10% or more below previous minimum operating levels.

Increased Mill Flexibility

Whether you need additional pulverizer capacity as the result of fuel switching or for a low NOx burner installation - the HEP Classifier can deliver.

Increased Combustion Efficiency

The HEP Classifiers ability to create a finer, more evenly ground coal for the burners, allows optimum combustion efficiency – that means better performance and less unburned carbon in the bottom and fly ash.

Faster Response to Boiler Load Demand

Rotor speed control is provided with a ramp time function that adjusts both the acceleration and de-acceleration of the rotor. This feature creates a temporary difference between the actual rotor speed and the speed demanded by the control system, allowing fast response to boiler load demands.
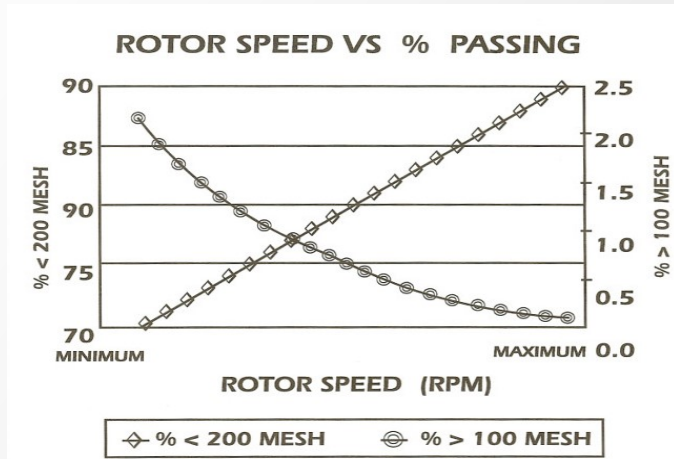
Typical Classifier Particle Size Distribution (Rosin-Rammler Plot)
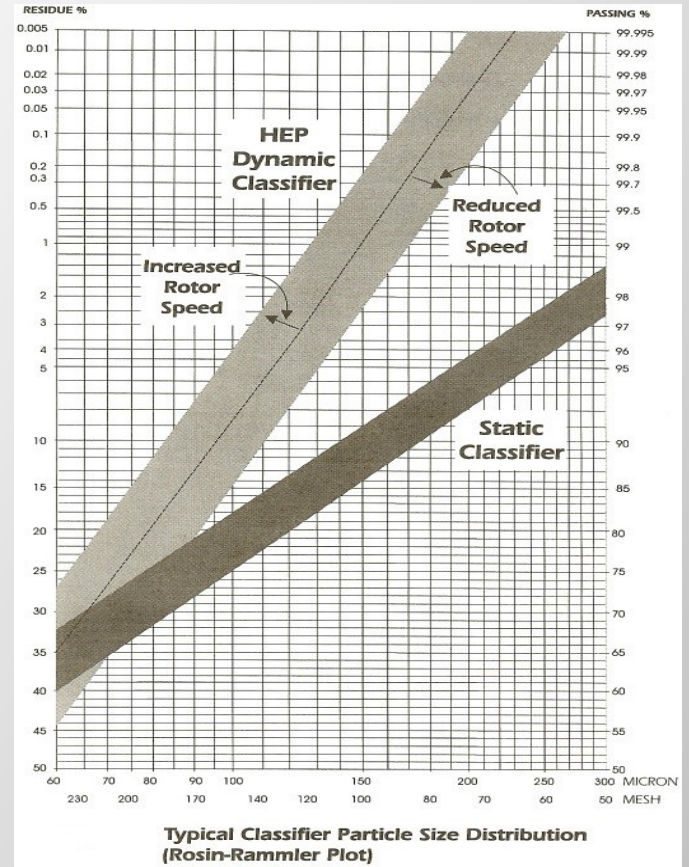
HEP Classifiers in operation by mill type

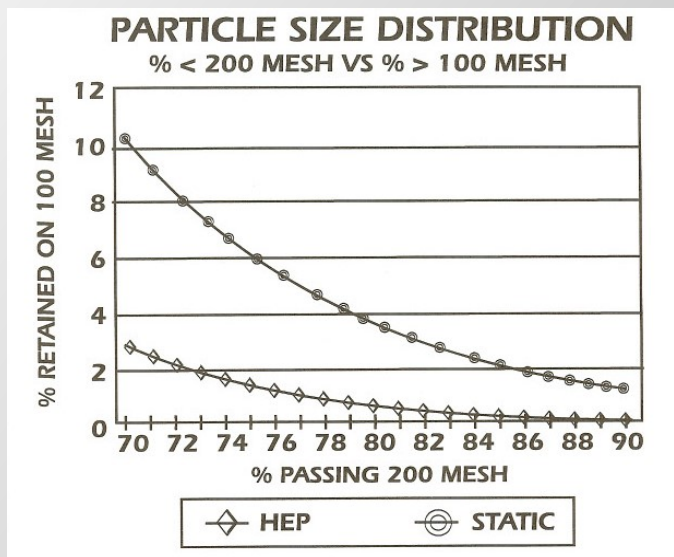| Mill Type	Number
MPS	25
E Type	24
EM Type	4
Loesche	5
Riley Ball	25
MBEL	1
MBF	23
Atox	2
Raymond	5
DTM Ball	15
Lopulco	1
TOTAL	**130**

Standard HEP Classifier configurations are available for all manufacturers and types of coal pulverizers.

Greater performance and reduced costs.

The HEP Dynamic Classifier substantially reduces the course fraction. In the figure below shows the relationship of the coal passing through 200 mesh (75 micron) verses the residue on 100 mesh (150 micron)
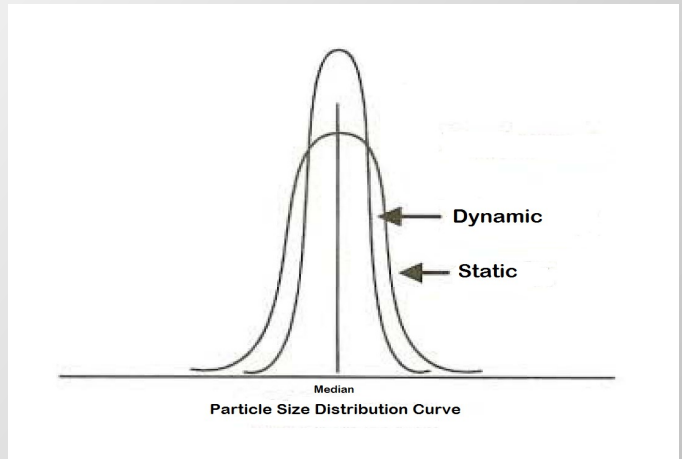

ROTOR SPEED VS % PASSING

The course residue with an HEP Dynamic Classifier is substantially lower than with a static classifier as can be seen in the Particle Size Destitution curve below showing % < 200 mesh verses % > 100 Mesh as a function of rotor speed.

PARTICLE SIZE DISTRIBUTION
% < 200 MESH VS % > 100 MESH

The HEP Dynamic Classifier, as compared to a static classifier, reduces the particle size range delivered to the burner.

Median
Particle Size Distribution Curve

The result is reduced NOx by minimizing sub-45 micron particles and LOI from large particles.

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