Quite often the exhaust from cartridge collectors are recirculated back into the work place. We are asked to provide efficiency predictions and guarantees. Cartridge collectors are much more efficient then either fabric pulse jets or mechanical shaker collectors. However obtaining accurate test measurements in the field is difficult and very expensive. Some of the suppliers in this field have run lab tests and tout their collectors or cartridges as more efficient than others. The efficiency of collection is affected by three factors:

Particle shape *Particle size* *Density*

Surprisingly, the most significant of these is particle shape. By the choice of a dust with a most favorable shape, it is possible to get higher efficiencies than would be typical when the collector is applied in the field.

One of the most frequently cited series of independent tests cited by many suppliers was run by the American Foundry Society in 1978. These tests were quite extensive and run in a automotive foundry on a side stream of a system that vented abrasive blast operations. This dust contained a wide range of sizes and shapes and is representative of dust generated in mechanical operations.

The types of collectors tested in this series were:

- *A conventional reverse jet fabric media collector.*
- *Two conventional reverse jet fabric media collectors in series.*
- *A conventional reverse jet baghouse with membrane coated filter bags.*
- *An electrostatically enhanced baghouse (DUSTEX Apitron).*
- *A reverse jet cartridge filter.*

In running these tests, particulate loads were measured simultaneously at both the inlet and outlet with an E.P.A. Method 1-5 sampling train.

The data was recorded and the results of these tests are summarized in Table I attached. Please note that the cartridge collector had two test runs. In the first run there was a defective cartridge. The defective cartridge was replaced and the test was run again. The second run was more indicative of the performance expected from a cartridge collector. This performance data has since been duplicated by both publicly and privately sponsored tests.

We have also obtained some more specific data on a similar application where size versus efficiency data on a dust sample were also obtained. This data is attached and labeled Figure 14. It can be noted that the collection efficiency versus particle size was not necessarily related to particle size as might be expected. The particle counter recorded all sizes 0.5 micron and below as 5 micron. Particle sizes 10 microns and above were treated as particles of 10 micron. Maximum efficiency was obtained at between two to three microns. This was related to the shape of the dust in this range. Other tests have obtained similar appearing curves. If the shape of the dust is interlocking, the efficiency will be higher and the shape of the curve is quite different. It can be noted that the results from the tests in Figure 14 are about the same as from the American Foundry test with a defective cartridge. It is our opinion that this higher emission level was due to poor seals on this particular cartridge collector configuration.

The DUSTEX Cartridge Collector with its patented arrangement has features that should give it special consideration in applying it to recirculation applications.

- *The cleaning system has a jet design such that the maximum pressure developed in the jet is much lower than the bursting pressure of the cellulose media. A common failure mode for some contemporary deisgns is leakage through a burst media. A rare occrurance of failure for the DUSTEX design is by plugging which is easily detected by an increase in pressure drop. A burst cartridge may not be accompanied by increased pressure drop.*

- *The seal between the mounting plate and the cartridge is a retained seal similar to an "O" ring design with premium grade resilient material that retains its seal after 10,000 hours of operation. This prevents any dust leakage through the sealing surface which is a common leakage path in contemporary cartridge designs.*

- *The cartridges are constructed with heavy gauge end plates and flattened expanded metal cylindrical inner and outer cores for increased strength and rigidity. To bond the media and cores to the end plates, high strength two part epoxy adhesive is applied instead of plastisol encapsulating compound commonly used with contemporary designs. This eliminates any possibility of leakage between the end plates and the potting compound.*

- *The clean side access without venturies allows for inspection of the clean side of the filter with minimum effort.*

The net effect is that we can offer elements that have extended life and whose efficiency does not deteriorate with time in service.

Because of limited accuracy in running many emission tests in the field, we do not guarantee performance to the levels shown in Table I. However, we are confident these *do represent the level of performance typical of our cartridge units over an extended period of time. We will guarantee down to 0.1 mg/M^3 (.00023 gr./ACF) after examination of specific application data.*

TABLE I

SYSTEM EFFICIENCIES
(TOTAL PARTICULATE)

UNIT TYPE	TEST No.	INLET (mg/m^3)	OUTLET (mg/m^3)	EFFICIENCY (%)
Electrostatic Baghouse	1	1054	0.19	99.982
	2	743	0.11	99.985
Two-Stage Baghouse	1	1040	0.26	99.975
	2	848	0.29	99.966
Two Stage Baghouse (after 1 month)	1	656	0.13	99.980
Two-Stage Baghouse (2 bag failures first stage)	1	860	0.29	99.966
Single-Stage Baghouse (conventional bags)	1	1804	25.17	98.605
Single-Stage Baghouse (membrane lined bags)	1	1300	5.37	99.586
Cartridge Filter	1	925	0.20	99.978
	2	1248	0.033	99.997