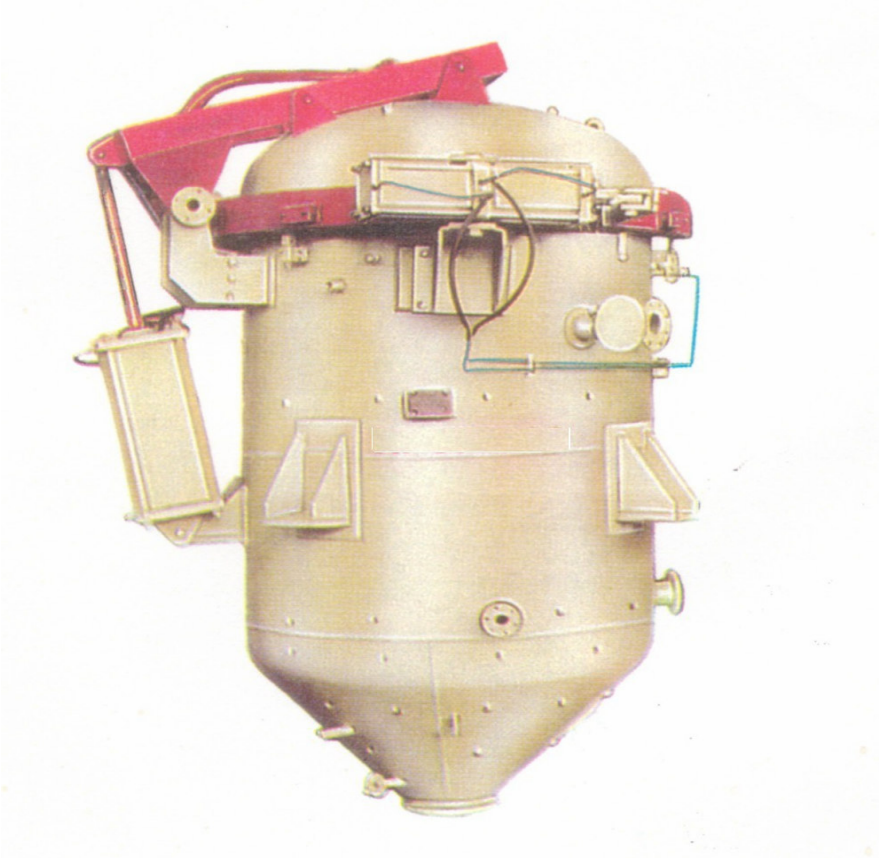
CARTRIDGE FILTER with PULSATION



Veritask Energy Systems, Inc.

51 Shaffer Rd., Bridgewater, NJ 08807-5604,
ph. 908-419-3996, FAX 908-636-2244,
e-mail : YakovKravets@Netzero.net

Filtration and Green Energy Inc.

- We deliver a comprehensive assessment of clients' filtering and purification processes, provide expertise, engineering, design, and supply filtering equipment and controls to achieve the most effective economic and technical solutions.
- Our design and filtering technique received the Golden Award at international exhibitions in Geneva (1993) and Madrid (1994)
- Our leading specialists in filtration have a combined experience more than 130 years.
- More than two hundred and fifty (250) of our new generation cartridge filters (See cover) were installed in Europe and Asia and demonstrated the advantages of our filtering methods, improved process economics, reliable operation, and easy maintenance.
- We work in cooperation with major equipment/control suppliers in the USA and Eastern Europe

Looking to set a new standard in filtering solutions?

Thinking of your O&M costs reduction?

Let us work with you to meet your goals!

Traditional Filtration

Filtration of liquids and suspended solids is based on their separation by passing through a filtering surface (or septum) made of cloth, wire screens, sheets of cellulose, etc. Suspended solids form a filtering cake on the surface of the septum. This filtering cake has uncontrolled and uneven porosity. As a result, the hydraulic resistance increases due to essential blockage of the filtering surface. The extend of blockage generally depends on solids' size and concentration, their physical and chemical properties (for instance, stickiness). For the above reasons, traditional filters suffer the following operational shortcomings **leading to significant operational and maintenance costs**:

- Low productivity (low average filtration velocities per cycle)
- Short operation cycle
- Inadequate product clarity
- Difficult filtering surface cleaning
- Short service life of filtering surface
- Excessive power use

Advanced Filtration

The advanced technologies are based on processes known as pre-coat and body-feed. Collectively they overcome the drawbacks of the traditional technology. Figure 1A explains the operation of the advanced filtration method. Each cycle starts with pre-coating of filter septum that ensures an even porosity of the filtering layer (layer I). The pre-coating is achieved by circulation of the externally prepared slurry. This slurry contains a suspended filtering aid (for instance, diatomite) and typically takes about an hour to form a layer of $^{1}/_{16}$" to $^{1}/_{8}$" thick.

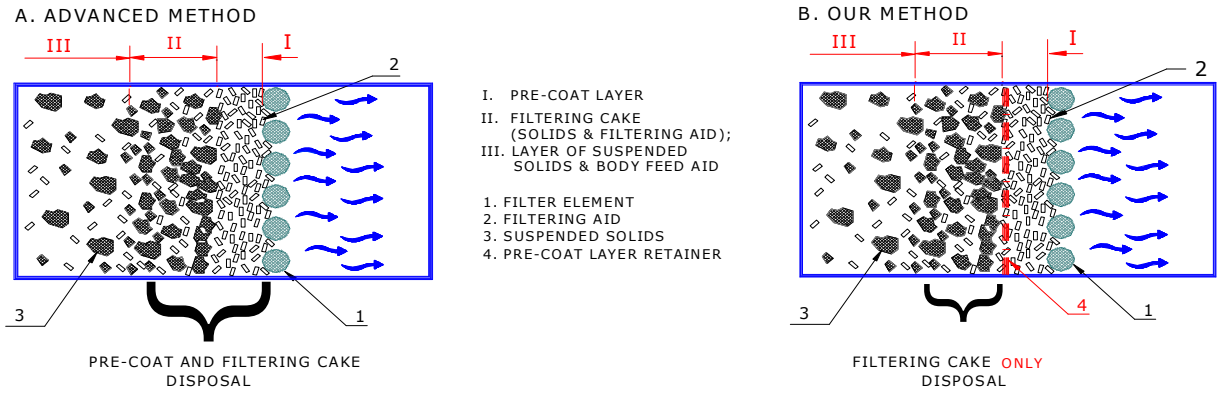
During the operation, a concurrent feed of a treated liquid and a filtering aid (BODY-FEED) helps to maintain lower resistance across the filter due to better porosity of the filtering cake (See zone II and III in Figure 1A).

At the end of a filtering cycle both layers — the layer of the pre-coat (layer I) and filtering cake (layer II) are disposed permanently, as indicated in the Figure 1A by the bracket. Typically, a complete filtration cycle takes about seven *(7)* hours and requires one (1) additional hour to dump the restore the pre-coat layer.

This method provides high-quality product and increases average throughput up to 50% of rated productivity. Yet, there are some significant limitations:

- Interruptions due to regeneration of the pre-coat layer account for 15% of the operation time
- Permanent loss of the pre-coat layer
- Re-circulation pump is required to prevent sliding of the pre-coat layer from a filtration element
- An elevated pressure is required to maintain the layer of pre-coat on the vertical septum
- The elevated pressure leads to higher operational cost

Figure 1. FILTERING METHODS COMPARISON



How We Improve the Advanced Filtration

To overcome the weaknesses of the advanced methods, we developed and implemented special feature —a retainer— to "fix" the pre-coat layer on vertical filtration element (See Figure lB, zone I). Once the pre-coat layer formed over the septum surface, it will serve no less than 23 hours, while maintaining high-quality of filtrate. Typically, it may be disposed at the end of the 24-hours cycle. In some favorable operating conditions, the same "fixed" pre-coat layer may be used up to 72 hrs.

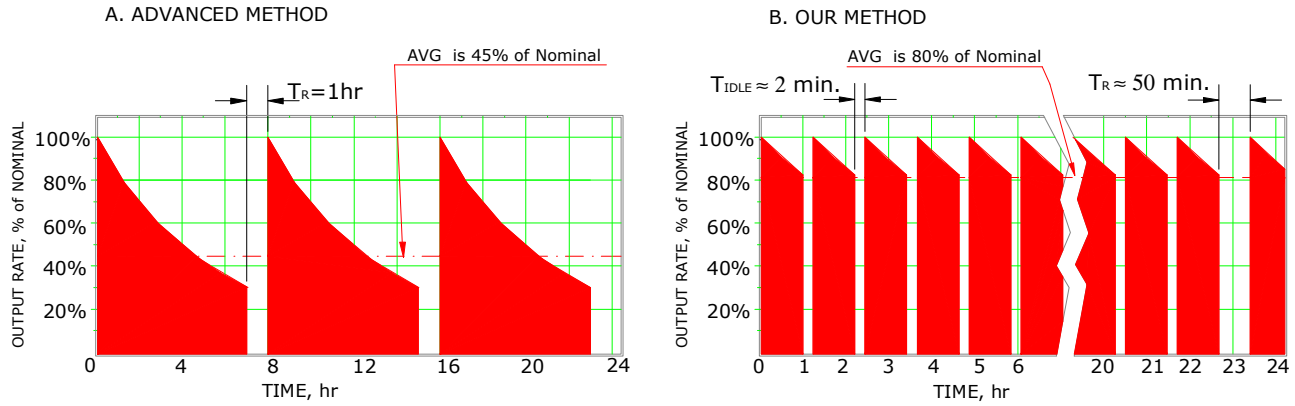
Due to unique and yet inexpensive design of the filtering element with the pre-coat layer retainer, neither regular process interruption nor load reduction would result in a loss of this layer. Thus, both the expensive pre-coat material and operation time losses are avoided. Unlike the advanced process, there is no need for the re-circulation pump to keep pre-coated layer in place. Therefore, additional costs of piping and control equipment are also eliminated.

Our filtering process uses only short stops for 2 to 3 minutes every hour (See Figure 1, B). At this time filtering cake accumulated over the "fixed" layer (zone II on FIG. 1B) slides to the bottom of the filter thanks to the gravity only. Then it is carried away by a small fraction of the treated media or remains in the cone section of the filter (See cover). These unique operating capabilities significantly improve productivity, and lower energy consumption. Due to combine effect of the reduced maintenance time and higher filtration velocities, the average 24-hour cycle productivity increases up to 80% versus 45% - 50% for the current advanced filtering process. The advantages of our filtration method advanced filtration method are summarized in Table 1.

Table 1. Comparison of the 24-hours operation cycle

Operational Parameters	Current Advanced Method	Veritask Energy Systems, Inc. Method
Productivity Rate, daily-average as % of nominal	≤50%	≥80%
Service life of the pre-coat material, hr/day	7	23
Filtering aid consumption, Lbs/ft^2/day	0.18÷0.21	0.06÷0.07
Number of pre-coating procedures a day	3	1
Duration of the maintenance required interruption, hr/day	About three (3)	Less than (2)
Effect of purification, % (percent of solids removed)	85÷90	95÷98

Figure 2. A DAILY CYCLE OPERATION DIAGRAM



Filtering Surface Regeneration (Back-Wash)

Following the completion of each filtering cycle the septum cleaning is required. The varieties of methods used in practice differ chiefly by extend of labor involved and by energy consumption. They also produce different regeneration effect. The best ones, with respect to economics are the methods that use pulsation or different types of shock effects ("bumping"). However, commercially available designs that implement this method have essential constrains imposed by the size of filtering surface and by longevity of the filtering elements.

Green Energy Inc proposes method and design that provide rinsing-like regeneration process, while increasing effect of regeneration and mitigating impact of the pulsation on the filtering element integrity. We supply two pulsation (rinsing-like) designs, of which at least one method suppresses all limitations of the concurrent commercial technologies. The effectiveness and applicability of the typical "bumping" shock-effect regeneration and pulsation methods developed Veritask Energy Systems, Inc. are presented in Table 2.

Table 2. Comparison of Regenerative-Pulsation Methods Performance

Operational Parameters	Method		
	Typical (or "Bumping")	Proposed Method (Design #1)	Proposed Method (Design #2)
Percent of filtering surface undergoing regeneration, %	100	100	10 to 25
Maximum Filter Area, sq.ft / [m^2]	215/[20]	430/[40]	No limit
Regeneration Effect, %	80 to 90	95 to 100	
Plant Air Pressure, PSI/[kPa]	35÷45/[250÷300]	7.5 ÷ 22.5/[50 ÷ 150]	
Back-wash Liquid Consumption, Filter Volumes(V)	5 to 6	1	

Notes:

1. All features mentioned in this bulletin have been patented and implemented on the Eastern European and Asian markets.
2. For detail information contact Veritask Energy Systems, Inc. (908)-419-3996 or FAX 908-636-2244.
   51 Shaffer Rd. Bridgewater, NJ 08807