

# Power Clean<sup>®</sup> Nutshell Filters



**C. Emery Nelson, Inc.**

INDUSTRIAL AND POWER PLANT EQUIPMENT

7631 Commerce Street, Hamel, MN 55340  
Ph: 763/ 420-3844 Fax: 763/420-2542



Solutions & Technologies

Power Clean® are the most effective, quickest regenerating nutshell filter media system available.



## HIGH PERFORMANCE + SIMPLICITY = LOWER COST!

**Power Clean® Nutshell filters are unparalleled in removing suspended solids and hydrocarbons from produced water or any water source. They are equally effective for the treatment of suspended solids, oily residues, ash and metallic hydroxides from industrial liquids generated by metalworking, power generating, municipal, chemical or petrochemical industries.**



The success of the Power Clean® media cleaning process is the fluidization process that easily strips contaminants and oil from the media, using very low volumes of backwash water without the use of surfactants or gas/air scour.

Pecan/walnut shell media resists fluid fouling better than other media. Due to the fact that it is unaffected by heavy oil surges, the media is easily cleaned and rarely needs replenishing (normally only 5% per year). This media process also eliminates the need for chemicals during filtration.

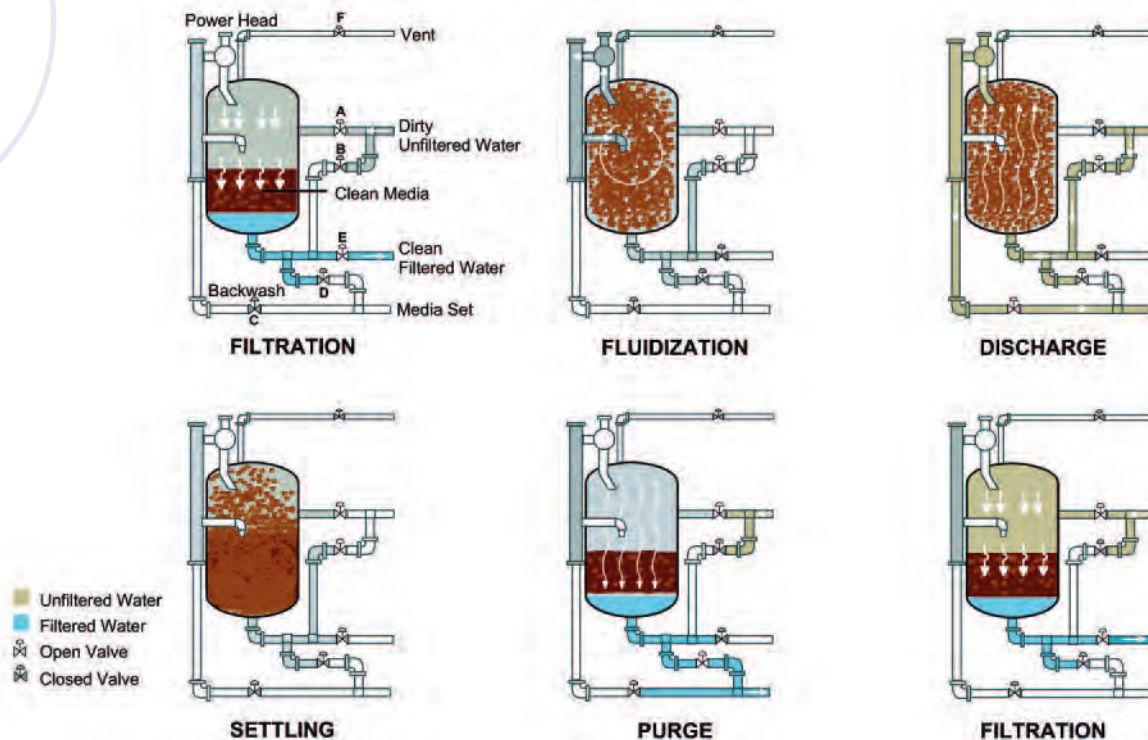
### Power Clean® Media

- Positive cleaning of media in only twelve minutes.
- Nutshell media used along with patented fluidized bed process.
- The media only requires a 5% replacement per year.
- Reclaims more oil.
- Upstream flow interrupted for only sixty seconds.
- 98% removal of suspended solids and insoluble hydrocarbons.

### Low System Costs

- Designed flux rate of 12.5 to 15.0 gpm/sq.ft. allows for smaller and fewer filter requirements for specific applications.
- Uses less floor space than other types of filters.





## OPERATING SEQUENCE

- The positive retention of the media within the vessel eliminates media loss and disposal problems.
- Separate pumps for feed and fluidization remove the necessity of having to size one pump at the flow rate for fluidization which is generally three to four times that of the feed rate and then adjusting it down to meet the specifications for filtration. Our process eliminates the severe energy penalty on the system that is found with single pump filters. One-pump systems subject an expensive pump to continual wear of the fluidization and feed pump operations. The Power Clean® allow for minimal use of the fluidization power head (only ten minutes per cleaning cycle), allowing use of a more economically priced pump for feed purposes.
- Utilizes unfiltered water for media cleanup, eliminating the need for high volumes of “clean” water storage.

### Less Chance of Problems

- The media is not “force set” after cleanup, eliminating the potential for damage and plugging of the bottom screens. The Power Clean® screen is actually cleaned during every regeneration cycle before the media settles back down. Other filter systems do not have this feature.
- No gas or air scour is required, thus reducing corrosion and environmental problems.
- Fluid quality is independent of outside interactions because no chemicals are used in the Power Clean® filtration process.

### Less Maintenance than Other Filters

- Simple, automatic design.
- Patented design to eliminate plugging problems.
- No chemicals, air or gas are required for contaminant removal or media cleaning.
- Scrub screen is external and can be accessed without vessel entry.

The external media scrub screen is easily removed for cleaning without vessel entry. The screen can be removed either from the top or bottom of the scrub housing. Removing from the bottom means less overhead space required and no need for an overhead crane. This configuration means that we have the lowest operating and maintenance height of any nut shell filter which is especially important when installing inside a building.





## OPERATING SEQUENCE

*See diagram to the left*

### A. Filtration

During the filtration cycle of the Power Clean®, the inlet feed fluid passes through valve “A” and enters the top of the vessel. The fluid is forced through the media where the solids and oil are removed. The clean filtered fluid exits through valve “E”. The vent valve “F” remains open during filtration to continuously remove any gas and oil from the top of the vessel. The filtration step terminates in one of three ways:

1. Time lapses (24 hours maximum)
2. Differential pressure (14 psig) or
3. Manually

Any of these methods will start the media cleanup cycle.

### B. Media Clean up

#### 1. Fluidization

The first step closes the “E” and “F” valves. After ten seconds valve “A” closes and valve “B” opens and the top power head is turned on. The fluid in the vessel passes through the fluidization power head, the scrubber assembly and back into the vessel through the fluidization nozzle. The fluid is jetted through the nozzle and into the media bed, creating a homogenous mixture of water, solids, hydrocarbons and media. This mixture is then circulated through the fluidization power head causing a shearing action that strips the oil and contaminants from the media. The entire bed fluidizes in a few seconds.

#### 2. Discharge

Once the bed is fluidized, valve “C” opens, allowing the dirty water to pass through the scrubber screen and into the discharge line. This water is replaced with inlet water through valve “B” and up through

the bottom screens. The water-media mixture continues to pass through the fluidization power head, down the outside of the scrubber screen and returns to the vessel. Dirty water passes through the screen in the discharge line and through valve “C”.

This process lasts for the amount of time (normally ten minutes) set on the PLC located in the control box. After the contamination level in the vessel has been reduced by approximately seventy-five percent (75%), the discharge is complete and valve “C” closes. Ten seconds later the power head is turned off. This final step cleans the separator system.

#### 3. Settling

The next step in regeneration is a delay cycle, which allows the media particles to settle. The fluidization power head is turned off, allowing the media to sink by gravity. This takes approximately one minute. Thirty seconds into the delay time, valve “A” will open, valve “B” will close and the fluidization power head will come on for four seconds to clear the media from the scrubber assembly. During the last thirty seconds the media will settle by gravity for the completion of this cycle.

#### 4. Purge

The last step in the media fluidization cycle is purging the lines and setting the bed. It is necessary to compress the bed to its filtering configuration and to remove the dirty fluid and heavy contaminants that remain in the bottom of the vessel. Valve “D” opens allowing the influent to be cleaned while passing through the media bed and forcing all contaminants out into the discharge waste tank.

#### 5. Filtration - 2nd Cycle

After regeneration has been completed the unit is ready to return to the filtration cycle. This is done by opening valves “E” and “F” and closing valve “D”.



## Operation Schedule

Operation	Valves					Feed Pump	Power Head	Time
	A	B	C	D	E & F			
Filtration	Open				Open	On		14 Hr*
Fluidization	Open					On	On	15 Sec.
		Open						
Discharge		Open	Open			On	On	10 Min.
Settling		Open				On	On 4 Sec.	60 Sec.
	Open							
Purge	Open			Open		On		60 Sec.
Filtration 2nd Cycle	Open				Open	On		14 Hr*

Blanks = Closed or Off

\* = Adjustable

### Nutshell Conversion to Power Clean®

The Power Clean® upgrade, because of its unique design, gives a “like new” condition to the media after every backwash, yet does it in a simple operation. This results in a very simple control panel, a small amount of external piping and a minimal amount of startup and operator training. In the final analysis, the “way” you “clean” the filter is the “key to success” in fluid filtration technology. However, it must be done in an easy, understandable manner, compatible with normal unsupervised operations.

### Sand Filter Conversion to Power Clean®

The Power Clean® design can be used to convert a “high rate” sand filter to a “high performance” filter. This conversion will increase the throughput by 60% and decrease the backwash volume by 90%, using the existing vessel. This will reduce supervision and operating costs and, at the same time, allow oil recovery from the backwash water.

## Power Clean® Sizing Chart

Model No.	Vessel Diameter (ft.)	Effective Filtration Area (sq.ft.)	Maximum Flow (BPD)	Power Head HP
PC25	2.5	4.9	2200	7.5
PC30	3	7	3200	10
PC40	4	12.6	5750	15
PC50	5	19.6	8960	20
PC60	6	28.3	12,900	30
PC70	7	38.5	17,600	30
PC80	8	50.2	22,900	40
PC90	9	63.6	29,000	40
PC100	10	78.5	35,800	50
PC110	11	95	43,400	60
PC120	12	113	51,600	75
PC130	13	132.7	60,570	100
PC140	14	153.9	70,200	100
PC150	15	176.6	80,600	100

**Veolia Water Solutions & Technologies**

315 N. Puente Street, Unit A

Brea, CA 92821 USA

Direct: 714-986-5300

Fax: 714-986-5301

Toll Free: 800-487-3458

E-mail: [whittier.filtration@veoliawater.com](mailto:whittier.filtration@veoliawater.com)

[www.whittierfiltration.com](http://www.whittierfiltration.com)

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