



## Environmental Systems

As a manufacturer of dry chemical, air purification scrubbers, Purafil ESD is frequently asked to compare the dry chemical Emergency Gas Scrubber (EGS) and the Wet Caustic Scrubber, both of which are capable of mitigating a one-ton chlorine release. The costs associated with the Wet Caustic Scrubber were obtained from an individual consulting engineer. Costs associated with the EGS were obtained from other experienced consulting engineers. No costs were discounted.

# Economic Comparisons: Dry versus Wet Caustic Scrubbers

## Equipment Pricing

### Dry Chemical Emergency Gas Scrubber

The specified Purafil ESD Emergency Gas Scrubber (EGS), reference FIS1, is a fiberglass vessel designed for inside operation and containing 25,000 lbs of CSO Media. The EGS equipment price of \$127,000 includes the scrubber system, a complete control panel and delivery to the job site. The price also includes a ten-year media insurance premium, a \$3,000 value. This premium guarantees complete media replacement in the event that 50% or more of the scrubber media is depleted in a single accidental Cl<sub>2</sub>/SO<sub>2</sub> release.

An additional \$3,000 premium is assessed for the second ten-year period under "Operation & Maintenance" cost estimates (below).

### Wet Caustic Scrubber

The Wet Caustic Scrubber equipment price is estimated at \$90,000, based on the referenced study and estimates obtained from other engineering consultants. The cost also includes a control panel comparable to the EGS and delivery to the job site.

## Operation & Maintenance Cost Estimates

### Wet Caustic Scrubber

**1. Descaling:** This service is usually required twice annually and includes descaling of caustic tanks, connections, fittings, nozzles, etc. Chemicals are involved but are not included.

- 16 man-hours labor for each cycle
- \$20/hr @ 2 cycles/yr
- **Total = \$640/yr**

**2. Caustic Replacement:** Annual caustic replacement is estimated at **\$2000/yr** and includes chemical cost and labor.

**3. Replacement Parts:** Experience indicates this could range from \$100 - \$20,000/yr. In many installations, caustic pump seals were frequently replaced. In some cases, the entire pump was replaced several times over the life cycle of the scrubber. It can be reasonably assumed that maintenance costs will total **\$4,500/yr** or 5-10% of the initial system cost.

**4. Routine Maintenance:** It is assumed that the scrubber system, though normally not in operation, is started up and operated at least once monthly for a two hour period. During this time, an operator observes and inspects system performance. The annual cost estimate for this service is 24 man-hours @ \$20/manhour = **\$480/yr.**

Total annual O&M costs for the Wet Caustic Scrubber: **\$7,620**

### Dry Chemical Scrubber

**1. Servicing of blower:** The only moving part in the Purafil ESD Emergency Gas Scrubber is the blower.

- 2 man-hours labor for each service
- \$20/hr @ 3 times/yr
- **Total = \$120/yr**

**2. Blower replacement:** This one-time cost over the scrubber's 20-year life cycle is estimated at \$2,000. The annual cost at \$2,000 divided by 20 years is **\$100/yr.**

**3. Media sampling:** Media is periodically sampled and analyzed (a free service) to assure full scrubber capacity.

- 2 man-hours for each service
- \$20/hr @ 2 times/yr
- **Total - \$80/yr**

**4. Media insurance premium:** The premium for a 10-year period is \$3,000. Total per year is **\$300.**

**5. Media replacement:** The worse-case media replacement would occur if the release consumed just under 50% of the media or 12,500 lbs. At 50% and greater the media replacement cost is covered by the Purafil ESD insurance premium payment, accounted for in item four (4). It is further assumed that this replacement is required once during the life of the installation.

*(Dry Chemical Scrubber - Continued on Next Page)*





## Environmental

# Economic Comparisons: Dry versus Wet Caustic Scrubbers

(Maintenance Costs Continued - Dry Chemical Scrubber)

- 12,500 lbs of media @ \$1.35/lb = \$16,875
- Freight @ \$0.15/lb = \$1,875
- Total of \$18,750 divided by 20 years = **\$938/yr**

Also, if we take into consideration that a worst-case release is unlikely, the above \$938/yr can be subtracted from the total Operation & Maintenance cost analysis. Total annual O&M costs for the Dry Chemical Scrubber:

WITH an accidental release: **\$1,538**

NO accidental release: **\$600.**

Capital Costs	Purafil ESD Dry Scrubber WITH an Accidental Release	Purafil ESD Dry Scrubber NO Accidental Release	Wet Caustic Scrubber
Equipment	\$127,000	\$127,000	\$90,000
Concrete Pad	\$1,500	\$1,500	\$1,200
Equipment Installation	\$24,000	\$24,000	\$36,000
Duct Work	\$10,000	\$10,000	\$15,000
Electrical & Instrumentation	\$8,000	\$8,000	\$14,000
Contractor OH&P (15%)	\$25,575	\$25,575	\$23,430
Contingency (20%)	\$34,100	\$34,100	\$31,240
Construction Cost	\$230,175	\$230,175	\$210,870
Engineering & Administration (20%)	\$46,035	\$46,035	\$42,174
Estimated Project Subtotal	\$276,210	\$276,210	\$253,044
Capital Depreciation Cost	\$276,210 (\$13,810/yr)	\$276,210 (\$13,810/yr)	\$253,040 (\$12,652/yr)
Operation & Maintenance Costs	\$30,760 (\$1,538/yr)	\$12,000 (\$600/yr)	\$152,400 (\$7,620/yr)
<b>Total 20-Year Costs</b>	<b>\$306,960 (\$15,348/yr)</b>	<b>\$288,200 (\$14,410/yr)</b>	<b>\$405,440 (\$20,272/yr)</b>

## CONCLUSION

The Purafil ESD dry chemical, Emergency Gas Scrubber is approximately **\$100,000 - \$120,000** less in cost than the Wet Caustic Scrubber.

For further information or test data about Purafil ESD's Dry Chemical Scrubber, please contact Purafil at 1-800-222-6367.



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