SHOWER FILTERS: A TECHNICAL DISCUSSION

"You gotta be kidding. Turn the page Eunice. No! Wait--- Just read the first paragraph, please!"

Why do we need a technical paper on shower filters? After all, they are nothing more than small drinking water filters mounted in the shower. And, we know all about drinking water filters. Right? Wrong!

Part of the problem lies with the failure to understand a dechlorinating shower device is not a water filter. It can only do one thing. It can reduce Free Available Chlorine by 90% or more for extended periods. That is all. It cannot remove organic contaminants or heavy metals like lead. It is not bactericidal. But, it can be bacteriostatic.

Before going further, let's do some quick comparisons between a water filter and a shower filter. Let's take a simple, plain vanilla 10" counter top. It is all or mostly organic carbon. The shower filter (SF) is most commonly a non-organic oxidation-reduction media. The C/T likes cold water, the SF likes hot water. C/T flow rate's are 1/2 to 1 GPM. The SF is 2 to 2 1/2 GPM at its design best. The C/T has about 30 to 50 cubic inches of media. The S/F is seen as low as 7 and up to 15 cubic inches. The C/T operates at 500 to 2000 gallons while the S/F is expected to perform efficiently for thousands of gallons. These two devices are hardly comparable.

From an engineering point of view, a shower filter really ought not to exist. Why? Because, you are asking a very small device to reduce massive amounts of chlorine for too long, with too little,

at too high a flow rate.

But it works. Again, why? In order to understand a shower filter and to design one, you need to look at some basic analytical realities. What do you want it to do? What are the impediments to that objective? What are the tools available to address those impediments? Where is the market for your device? Is the incentive enough to go through the exercise of developing it? Let's talk about some of these problems.

O.K. LET'S DESIGN A SHOWER FILTER

Before we start to design a filter and before we address each of the planning components described later, we need to make a decision. Do we want to build a $10.00 watch or a $3000.00 Rolex? Do we want something in the middle?

These decisions affect our media and engineering decisions.

We use our own AME(S) process. AME(S) stands for;

- Analytical factors
- Modality factors
- Engineering factors
- (Sizzle factors)

The first three are hard factors. The sizzle factor is in brackets to remind us that it is nice to have, but not necessarily a controlling factor in the design.

ANALYTICAL FACTOR

What do we know about the water we want to dechlorinate? What about pressure ranges? How

do you deliver from gravity fed water to 65 psi or more? What about the media? Where are they? What are they? What kind of filter should be designed? The list obviously could go on.

MODALITY FACTORS

What are types and modes of media that can be used for this job? The list we developed in the Analytical Factors, included;

- Granulated Activated Carbon (GAC)
- Carbon Block
- Redox media (atomized brass)
- -KDF 55
- -KDF 85
- -KDF Fines
- -KDF Filament
- -KDF Coarse
- Calcium sulfite
- Ascorbic acid
- Infra red ceramics
- Sizzle media like,
- - Electro Magnetic Crystal
- - Polyester
- - Zeolite
- - Magnesium oxide

Then there is always the secret proprietary ingredient, which we call Aunt Tilly's Magic Mouse Milk from the Planet Uranus. It sounds impressive, but like mouse milk, less than useful.

ENGINEERING FACTORS

This is also another tough one. How do we design the filter?

Do we design our own unique housing? Should it be a cartridge type? How do we minimize common failures such as the cracks in filters? Do we need to look at the filter and the showerhead

as a “delivery system”? If so, how does that affect our basic engineering? Do we want any cosmetic design “goodies”? Is it consumer friendly?

The most important question of all is; once we answer all the above questions and more, finally, will it work? Will it reduce toxic chlorine to the extent needed to make a marketable device?

SIZZLE FACTORS

As market acceptance of shower filters grows, expect to see improvements in media and the shower device itself. Enhancements to the feel of the water and improved soap and shampoo lathering will become more important. Why? As the novelty of shower filtration wears off, the quality of the shower delivery becomes a bigger factor.

MEDIA DISCUSSION

There is simply not enough space to adequately discuss the various media available to a shower filter designer. The following is a thumbnail description of the media and a reference to some providers of those media. Because of limited space, we refer you to the last issue of the Water Technology Buyers Guide for media providers (note: always keep a

copy of the Guide handy for ready reference).

CARBON, BOTH GAC AND BLOCK;

Whether GAC or block, carbon is superb in dealing with both water and air contaminants. It does have its limitations, however.

Activated carbon is **adsorptive**, not **absorptive**. This is a major difference. Carbon attracts or binds, contaminant molecules to its surface. This adsorption is not very strong and can be

reversed.

Carbon is limited in useful gallonage. The Problem is compounded by the very nature of the carbon block's filtration technology.

Carbon is inadequate because of high temperature needs and the small amount that can be used. For Carbon providers refer to the Buyer's Guide.

OXIDATION-REDUCTION (REDOX) MEDIA

Since 1989, we have worked successfully with all forms of KDF's redox media for shower, bath, garden and hydroponic applications. At present we use mostly KDF-55 and KDF-73.

Different from carbon's limited adsorption capability, KDF creates an electrochemical environment. This galvanic action allows for the reversal of the original chlorine creation process. This electrochemical reversal converts Free Available Chlorine to a harmless and soluble calcium chloride. For those not familiar , KDF media is a brass alloy (copper and zinc). These dissimilar metals allow for the creation of the galvanic action. This principle allows for long term usage impeded only by sediment or particulate matter that might occulude the surface, thereby reducing the media's ability to generate electricity.

For more information please review our company's Technical Papers at www.rainshowermfg.com and KDF Fluid Treatment's website at www.kdfft.com.

BALANCE OF THE MEDIA

We will briefly touch on the remainder. If we can help you understand more, e-mail us at Rainshow'r.

- **Ascorbic Acid**: Used in Japan with limited success. It is Vitamin C. Lowers pH of water. As

acidity rises, gases in solution tend to be released. Various Asian sources.

- **Infra red ceramics:** Used in Far East. Limited use in U.S. Reputed to contain dramatic water changing capability. Expensive. No hard data. Avoid those with alpha particle radiation. No source.

- **Calcium sulfite:** Used for some time in Japan. Reported to scavenge chlorine. Reported to have effect on chloramines. No data. Very limited gallonage in our experience. Converts chlorine to calcium chloride. Domestic source, Chemical Companies, use Internet Search Engine.

- **Electro-magnetic Crystal:** Pure virgin crystal is silicon dioxide. It tends to reduce water cluster size making water feel lighter. Does not soften water. Evidence is empiric, but strong. Need treatment to increase activity. Source, U.S. mines.

- **Polyester material:** Good trap for large particulate matter. Source; various.

- **Zeolite:** Earth mineral, thought to have some benefit, but fouls redox media. Not recommended. Source, various U.S. mines.

- **Magnesium oxide:** Reported to have some effect on water. No data. Limited use. Source, U.S. chemical manufacturers.

CONCLUSION

In preparing this paper we developed more data than we could use. But, we cannot close without emphasizing several points.

- Shower filters are not toys. As market acceptance and demand grows, pressure on manufacturers to put more money into design, packaging and advertising will escalate.
- The identification of this device with the general health of the user will only grow. It's contributions to skin and hair betterment are already there.
- The demand for bath and small container dechlorination is already here and available in the market.

- Manufacturers will be forced to develop and market accessories to the shower and bath market.
- The export market is very real for U.S. makers. It cannot be ignored.

Although the market is still small, shower, bath, and even garden dechlorinators have established a foothold in the water industry.

We hope you have found this discussion useful.

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RESUME:

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