"DID YOU CALL ME A SAPS!"

By

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When I sat down to begin writing this paper, I had the usual problems with trying to figure out how to start. I mean after all, how do you start a paper out that has the title, "DID YOU CALL ME A SAPS!" ? You immediately feel like one, simply for using that title. Well, after you get past that, it's time to reflect on the real reason that you are giving your first non-chemical treatment talk. Will this lead to a new title of Mr. SAPS instead of Mr. Ammonia, or Mr. Water Wheel, or my latest----Mr. Manganese. You know, it's sort of funny the way people attach specific labels to others, especially when it's only that one thing that they know about the person. Is anybody here old enough to remember that old song that goes, "Sign-Sign-Everywhere a Sign?" Before I get to strung out on philosophical conjecture, I guess I better get back to why I am giving this talk.

Over the years, and contrary to many others opinions, I have always tried to find the, 1--Most environmentally compatible and, 2--Most cost effective method of treatment, for each specific situation. Because of the rules, regulations, laws, etccccccc., it seemed as if I was on a "Better living through Chemistry" binge. I say because of the laws and regulations, since there was no real allowance for variances from specific water quality or technology based effluent limits. With this unwavering resistance to examine alternate limits, real and true research into new methods of passive treatment were limited to what had always been proposed, and that of course were wetlands. Eventually, in the latter part of the 80's, ALD's became quite popular in conjunction with wetlands. However, you know what, no matter how many symposiums or conferences I attended, I never saw a discharge effluent that gave me goose pimples. Now, don't get me wrong. I love wetlands, and as long as your water has no aluminum, iron, or dissolved oxygen, I think anoxic limestone drains are great. So in effect, I always came away from the meetings with sort of an empty feeling about passive treatment methods. I would always recount the same thought after each such conference, "Passive treatment systems are great if you don't really have a problem, and if you don't really have a problem, the capital justification is simply not there to put one in." As such, I focused on methods of treatment that would assist an individual or company in meeting NPDES effluent limits, and that was of course through various types of chemical treatment. NOW, don't get me wrong, I didn't loose the faith about passive type treatments. In fact, what kept me hopeful was the success I had with a bio-remediation treatment system that Jo Davison did

(free of charge) for me at Leckie Smokeless Coal Company (now Royal Scot Minerals). Isn't it funny that how some of the best things in life are free? Anyway, that system was hailed by many as a fairy tale type deal that wouldn't work. Skeptics, skeptics, and skeptics galore. They said that because of the pH, the iron would come out on it's own if you just left it alone, and it wasn't anything to do with the **Bio-Carb** process by Jo Davison. Oh yea of little faith! Don't you think I knew it would come out of solution on it's own? The problem was getting it to settle enough prior to the discharge pipe in order to meet NPDES iron effluent limits. Prior to the bacteria, I was spending $ 120.00 per day to meet effluent limits. Yes, I could have dispensed with treatment had I a "Gulf of Mexico" size settling pond to provide enough retention time for the ferric iron to settle. However, that was not the case, and the bacteria ended up doing the job. But do you know what? For the first year or so, the bacteria only worked at about a 50% efficiency. I could still never meet NPDES limits without help from chemicals. All that changed one morning when my "treatment specialist" (guy who treated the water), Mike Daily, came in and told me he had been reading Mother Earth News and he reckoned he knew what was wrong with the "Bugs". "They weren't working good cause they was hungry." He told me he was going to try a few bags of 10-10-10 at the head of the ditches, since the magazine said they needed potassium, phosphorous, and nitrogen to work properly. I told him as usual, to be all he could be, and go for it. It was absolutely the most incredible thing I ever witnessed. Within 36 hours, the system was meeting effluent limits regarding iron. Since that was my only problem, supplemental treatment ceased. To this day, the only money spent on treatment for that site is, for 2-3 bags of fertilizer maybe once a month. **Ahhhhhhh, the "Magic of Water Treatment"--"How sweet it is."** I learned a couple of real important things from this experience. First, passive treatment could be utilized effectively to meet NPDES effluent limits, and Secondly---that common sense, and not educated intelligence, is the most important component in water treatment, and perhaps in life. For the First thing, I will always remember Jo Davison. For the Second, I will never-ever forget Mike Daily. Wellllll, that very thing kept me in the search for a passive system that could work in lieu of chemical systems that were required in order to meet limits.

As you might imagine, I saw many magic carpets over the next few years, but none of them could really pass the "good o'l boy test" when it came right down to it. Could they actually fly? Well, as a political figure recently coined this phrase, "It depends on how you define, fly." However, out of the blue, I was at a meeting and heard Doug Keppler and Eric McCleary talk about something called a SAPS. I believe it was a watershed type meeting, but that's not really important. What so thoroughly impressed me was the simplistic, common sense, and "good o'l boy" approach that had been taken in the design of these things called SAPS. I was immediately, and I mean immediately, on board for the entire ride, and I'm still having a great time. Whether or not Doug and Eric were the persons who came up with the first idea of a SAPS, I don't know. But I do know they were responsible for reigniting my "Passive search flame", and because of that and what they have done in West Virginia regarding our advancement in this area, I hold them up in the same light with Jo Davison and Mike Daily. You know what? I'll probably take some hits for my stance on any and/or all of these people I hold in high regard, but I don't care. I try to wade through the mire and see what the artist is really trying to say in their work. Sort of like in the movie, "***What Dreams May Come*** ." I don't know about you, but my tear ducts never have fully recovered since I saw that movie. Anyway, I want to pay tribute to Doug and Eric for the new hope I have in finding a Passive Treatment system that can actually compete with chemical alternatives.

Now, for all you Existentialists, pessimists, and college graduates out there, that say a SAPS isn't truly passive since it has pipes and valves, I have but one thing to say, **take a pill and chill !** After twenty plus years in the water treatment business, SAPS are a passive type treatment to me. Well, this sort of leads me into the next part of my paper that deals with how SAPS got started in West Virginia, and what they have meant to some of us.

After hearing their talk on SAPS, I came back to Southern West Virginia and looked for places I could apply this technology. To make a long story short, there are 10-20 SAPS sites in the state. I have been honored in participating in 4 or 5 of these installations as a liaison consultant, and it has been fantastic. However, I think the person that has picked up the torch and ran for the finish line is Gary Persinger of WESCAR, Inc.. Gary, in conjunction with Doug and Eric installed a SAPS system known as Upper Slaughter's Creek about two years ago, and it is still working fine. Since that time, Gary has combined some more recent technology in his SAPS construction to even begin addressing the Mn issues. Whoops-----hold the phone a minute because I am getting ahead of myself. Let me back up to where I looked for places in Southern West Virginia to put some SAPS. There was still a problem concerning effluent limits regarding Mn in the successful implementation of a SAPS system on a site having an NPDES permit. Wellllll, it so happens, that at about that time, a close look was being taken at the toxic effects of Mn in comparison to the over treatment most often required to achieve Mn effluent limits. I want to take a minute and applaud all those concerned in this exercise, of taking a scientific approach towards a problem. In the end, a protocol was implemented to evaluate the difference in toxicity between a Mn Report Only limit versus Instream or Technology based limits. In conjunction with the protocol, the law was eventually changed with regards to the instream Mn concentration, moving from 1 mg/l to 2 mg/l. All of these things occurred within the period of a couple of years, and presented SAPS an opportunity to debut as a passive method by which to treat and meet normal NPDES effluent limits, minus manganese.

As with all manners of doing anything in life, whether it be installation of a treatment system, or the method by which you wax your car, you learn from that first time what you might do different the next. So it was with SAPS. Since the time that those first SAPS were installed in Southern West Virginia, much has been learned, and much changed with regards to the original designs. Perhaps one of the most important things we learned from the initial sites was, that our flow information for design purposes really **sucked .** Duh, imagine that. We might as well have used the old reporting methods of flow such as "Normal"--"Below Normal"--"Above Normal" for calculating the size of the SAPS for meeting effluent limits. This is the "ONE" area in my occupation that I have really tried to turn around when it involves any type of treatment remediation work. You can easily calculate the treatment requirements per gallon, whether for an active or passive system. However, what does any of that matter if you don't ***truly*** know the flow amounts you will be dealing with. Flow is everything. It tells you:

1--how large your sediment structures need to be with regards to retention time.

2--what size treatment system to install with regards to storage tanks, etc.....

3--it tells you what size chemical storage facilities will be required if you are looking at volume usage.

4--it gives you the cost justification (payback) of one treatment system versus another.

5--it provides enough information to calculate approximate sludge disposal costs.

I mean, come on, what can you really do with confidence, without accurate flow information?

Other than flow, we learned that contact time with the limestone was critical with respect to the optimum design. I realize that probably sounds like a pretty stupid statement, since it is a given, but how many obvious-common sense, "Good o'l Boy" type stuff do us educated people overlook? This realization led to multiple manifold type systems in order to cut down on channeling, and promote more even distribution of flow. From the multiple manifold systems, came the realization that it makes a difference how and where you install the different manifolds themselves. Do you go, back to front, side to side, even flow distribution throughout? Then another obvious design parameter presented itself for consideration. Along with multiple manifold systems, do you incorporate multiple manifold--multiple tier designs. This is the real mind blower, if you think about it, because it opens the door up to numerous other possibilities. The first one of these I heard about was in Pennsylvania. I had worked on a project up there doing an evaluation on an existing passive system, and suggested that they reconstruct their SAPS for what I felt were certain design flaws, based on what we had learned over the preceding two years. After that was accomplished, I got a call from one of the lead people in water treatment for the company, telling me what they had done. I was astounded. They had installed a multi-manifold, two tier system during re-construction. Based on the results I have seen so far, it is working great. Be it that, why did the two tier system really excite me?

I was excited because of the work I had heard that Gary Persinger of WESCAR, and another anonymous individual was doing with steel slag. Yes, I know what you are going to say, but steel slag does appear to have some real application. I had heard about Gary Persinger using Steel Slag in SAPS, in leach beds, and anything else he could think up. I want to stop one more time and give a certified-full standing salute to Gary Persinger and his boss, Jim Corsaro, for their work on passive treatment technology. I want you to know that most of the analysis and a lot of the slides being seen today, are from their property. Anyway, I went down and toured Gary's sites and was "totally" impressed. He showed me the analytical results of the Slag SAPS, and even told me he was having to by-pass some of the Slag SAPS water because the pH was too high. Imagine the music to my ears after all these years to hear someone say that "the pH coming from their passive treatment system was too high." Not only that, but it was taking out manganese, which if you will remember from the SAPS data chart we reviewed, the Slag SAPS was the only one really doing that in a big way. WHAM! POW! BAM! (Do you think I'm getting ready to lead in to an old Batman and Robin episode?) It was like fireworks going off. Multiple manifolds, multiple tiers, and steel slag, what a combination! Why was the combination of these three so significant?

1--First of all, the three when combined, helped to compensate for the lack of flow information, peak flows, and potential pH problems during colder periods. I know this is presented as the first category, but all the things mentioned sort of work together. The ability to treat excess flow by a lower tier of steel slag, or increase pH by that lower tier in colder weather when the bacteria/organic contribution might be suppressed, ***is super-fabulous.***

2--There are still places that cannot acquire Mn variances for one reason or another, but are

in a position to justify the expense of a passive treatment system like a SAPS. The ability to use Slag and raise the pH up high enough to meet NPDES effluent limits concerning Mn, ***is super-fantastic*** .

3--Finally, and there are other reasons not mentioned here, our testing with regards to the Manganese Protocol has shown, **" in some instances "**, a definite increase in mortality with treatment for neutralization versus treatment for complete Mn removal. Now, normally, this occurs in extremely degraded water, where as it so happens, the levels of Cu, Zn, and Ni are usually elevated in conjunction with the Mn. In those instances, we run toxicity tests at different pH levels to determine the best range for optimum survival. In fact, in some situations, the company is treating to an 8.5 pH in order to attain the "best" quality discharge possible. It just so happens at this level that the heavy metals are gone, along with a partial reduction in manganese. Therefore, are we back to the surrogate theory? Possibly so, and we may have had the right idea, but just went a little too far concerning the type of final Mn limits we imposed or, if Mn limits were appropriate at all. **What is so radical in finding the problem with a certain water and fixing that problem, rather than fixing a problem that indicates you might have a problem, which ultimately does lead to a problem ?** Did that sound confusing to you? Let me put it this way. If Nickel and Zinc are the problem concerning toxicity, then treat for Nickel and Zinc. Don't treat for Mn with the knowledge that once you get rid of it, you got rid of the other two metals. The case is, that you probably did, but in the process created a worse problem from over-treatment. This form of treatment reminds me of the Middle Ages cure for sickness--bloodletting. You remember, no matter what the problem, just drain most of the blood from the patient and if it didn't kill him, maybe he would be cured. Well, as we know from history, that didn't work so hot, did it? So why do we apply the same mentality to water treatment. It is not that hard to do the right thing, so let's do it. Let's cure the patient for what is actually wrong, rather than for something else in the hopes it will cure the actual problem. Wellll, I did it again, didn't I? Off on the manganese problem again. Sorry about that, back to the case in hand.

The multi-manifold----multi-tier----slag SAPS gives us the flexibility to treat for the actual problem, rather than simply for complete Mn removal. That is why I am so-so-so-so excited about all the advances being made in the SAPS designs by people like Doug Keppler, Eric McCleary, Gary Persinger, and other anonymous individuals.

What do we have to do to assist in the continued advancement of these new SAPS design.? It is quite simple. Just use common sense in the formation of effluent limits in the same manner we have used common sense to compensate for problems with the existing effluent limits. Allow for the use of these type passive systems when supporting documentation demonstrates their effectiveness with the existing downstream aquatics. Utilize toxicity testing, benthic surveys, and other analytical information to move forward.

Stop the bloodletting.

NOTE: Stay tuned----I'll try to give you an update to more advances during the symposium next year. You all come back,-----hear?

SUMMARY REVIEW OF CERTAIN OPERATING SAPS IN WV & PA

SAM. ID	PH	COND.	SO3	ALK.	ACID.	FE	AL	MN	FLOW (GPM)	AGE (YEARS)
SAPS #1--RAW	4.17	1,210	832	<1.00	106	0.93	22	15	25	2
SAPS #1--DISCHARGE	7.15	1,100	570	68	<1.00	0.33	0.50	7.68	25	2
SAPS #2--RAW	3.33	1,310	716	<1.00	196	1.12	23.10	15	35	0.50
SAPS #2--DISCHARGE	7.50	1,300	706	30	<1.00	0.08	1.00	14	35	0.50
SAPS #3--RAW	4.13	1,000	498	<1.00	180	0.23	26.10	18	30	1.3
SAPS #3--DISCHARGE	7.49	1,010	401	94	<1.00	0.14	<0.40	13	30	1.3
SAPS #4--RAW	3.29	1,275	239	<1.00	176	1.34	23.80	2.80	70	2
SAPS #4--DISCHARGE	6.73	1,025	515	28	<1.00	<0.05	<0.40	1.15	70	2
SAPS #5--RAW	3.02	1,450	1,103	<1.00	660	1.07	79.30	35	25	0.30
SAPS #5--DISCHARGE	11.33	1,550	620	180	<1.00	0.07	<0.40	0.02	25	0.30
SAPS #6--RAW	3.28	1,074	600	<1.00	250	8.90	26.82	6.60	50	0.50
SAPS #6--DISCHARGE	7.11	927	480	96	<1.00	0.80	0.31	6.80	50	0.50
SAPS #7--RAW	3.21	3,416	1,680	<1.00	1,500	0.93	121.71	49.20	30	1.50
SAPS #7--DISCHARGE	4.25	2,562	1,480	<1.00	450	1.90	61.32	39.50	30	1.50
SAPS #8--RAW	4.65	1,596	1,000	<1.00	20	0.34	4.64	7.60	40	2
SAPS #8--DISCHARGE	7.53	1,463	800	41	<1.00	0.14	0.09	1.34	40	2
SAPS #9--RAW	3.24	1,680	1,320	<1.00	300	30.30	16.90	49.40	20	0.50
SAPS #9										

SAPS #9-- DISCHARGE	6.33	2,176	1,660	63	<1.00	0.42	0.18	48.90	20	0.50
SAPS #10-- RAW	3.90	3,090	2,865	<1.00	723	233.25	54	147	85	0.50
SAPS #10-- DISCHARGE	6.60	2,170	1,350	50	37	5.58	0.64	74.50	85	0.50