Pozniak, Mike

From: Turner, Anne
Sent: Wednesday, August 25, 2004 3:19 PM
To: Pozniak, Mike
Subject: FW: Applied Process Technology, Inc. Preliminary Proposal 1366

Mike

Here is the initial information I received from APT with treatment and O&M costs.

-----Original Message-----
From: Peter Herlihy [mailto:PHerlihy@worldnet.att.net]
Sent: Saturday, June 19, 2004 10:45 AM
To: Turner, Anne
Cc: Doug Liddie; Trixie Mardo
Subject: Applied Process Technology, Inc. Preliminary Proposal 1366

Anne – Your web inquiry for Ozone/Peroxide treatment system for 1,4-d in Michigan was forwarded to me. Please consider this email Applied Proposal #1366, and very Budgetary.

As you can expect, the more we know about the water the better estimate we can provide. Assuming relatively low TOC and alkalinity, and a pH of <7, the ESTIMATED operating cost for the streams is as follows:

1) 500 gpm 1200 ppb 1,4-d influent, <10 ppb effluent operating cost of $0.31 / 1000 gallons
2) 650 gpm 85 ppb influent, <10 ppb effluent ops cost$0.15 / 1000 gallons
3) combined stream of 1150 gpm, 570 ppb influent <10 ppb effluent ops cost of $0.26 / 1000 gallons

Operating costs defined as chemicals and power (no labor), Power at $.12/kw-hr, Oxygen at $0.60/ ccf, and Hydrogen peroxide (35% soln) at $3.00 / gallon.

You can see that treating the streams separately will have an average cost/1000 gal of $0.21, an advantage over a single, large system. The penalty is redundant equipment / capital cost premium for two small systems vs one large.

Our Engineering ranks are depleted this week due to jury duty and vacations, more accurate costs can be had in a couple of weeks, but a very PRELIMINARY ESTIMATE of sale prices for the systems are:

1) 500 gpm to treat 1200 to <10 ppb $505,000
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All systems are containerized and freeze protected. All prices include 5 days on site for commissioning and training and are FOB California. Payment terms are 25% down, 65% net 30 days from ship date, and balance net 30 after commissioning or 60 days after shipment, whichever is first.

Customer is responsible for offloading, installation, construction and operating permits, all consumables, all analytical work.

I am traveling all this week, but will be checking email daily and can be reached on my cell.

Sincerely,

Peter Herlihy
Manager, Eastern Region
Applied Process Technology, Inc.
Phone 513 759 5333
Cell 513 476 5600

Pozniak, Mike

From: Turner, Anne

Sent: Wednesday, August 25, 2004 3:22 PM

To: Pozniak, Mike

Subject: FW: Applied Process Technology, Inc. Preliminary Proposal 1366

Mike

Here is the recent email response from APT. I phoned Peter Herlihy with questions. I then summarized our conversation and emailed this summary back to him for his review. This email includes his comments to my summary.

-----Original Message-----
From: Peter Herlihy [mailto:PHerlihy@worldnet.att.net]
Sent: Tuesday, August 24, 2004 2:21 PM
To: Turner, Anne
Subject: RE: Applied Process Technology, Inc. Preliminary Proposal 1366

Anne – my edits

> -----Original Message-----
> **From:** Turner, Anne [mailto:Anne.Turner@WestonSolutions.com]
> **Sent:** Tuesday, August 24, 2004 1:25 PM
> **To:** Peter Herlihy
> **Subject:** RE: Applied Process Technology, Inc. Preliminary Proposal 1366
>
> ANNE - I have put in some edits to your text as well as answers to your questions denoted by **** before and after the edited area****. If you don't mind, could I look at your final edits before you distribute? - Peter
>
> Peter:
>
> I appreciate the time you have spent providing information on APT's hydrogen peroxide/ozone treatment systems. Below is a summary of our conversation yesterday. I would again appreciate it if you could review and confirm the information you provided me, as well as respond to a couple more questions (in red). WESTON fully understands that the information you have provided should be considered very conceptual, very preliminary and very budgetary. Again, the proposed system requirements are: est. flow rate =1,150 gpm; est. influent conc. = 570 ppb 1,4-dioxane; effluent conc. goal = 10 ppb 1,4-dioxane; influent has relatively low TOC and alkalinity, and a pH of <7.
>
> **Treatment Unit Size** - APT estimated system would require space for the following system components: 1 - 40' x 8' x 9' unit to house hydraulic components of the packaged system; 1 - 40' x 8' x 9' unit to house the supply equipment (hydrogen peroxide tank and pump, control panel, etc.); 1 - large liquid oxygen tank (est. size 5' diameter by 15' high) with accompany vaporizers; sufficient ground space for trucks to deliver liquid oxygen; additional ground space to secure system (fencing, potential guard shack).
>
> **Liquid Oxygen vs. Oxygen Generation** - The generation of oxygen ****on-site is technically feasible but should only be considered if there are barriers to liquid oxygen storage / handling or abnormally high liquid oxygen prices****. Both the capital and operation costs of on-site oxygen generation are most likely significantly greater than those associated with utilizing liquid oxygen stored on-site as the oxygen source.
>
> **Treatment System Safety (On-site Liquid Oxygen for Oxygen Source)** - There are potentially

significant health and safety issues associated with handling and storage of liquid oxygen. However, these concerns can be sufficiently and successfully managed and controlled by securing the site and following proper liquid oxygen handling procedures.

System Chemical Requirements - 40,000 cubic feet of liquid oxygen per day is a reasonable estimate of the proposed system oxygen requirements. ****The actual flow is about 30,000 cubic ft per day of oxygen gas. There are a couple of ways to express the volume of gas used for this case.... one is liquid Oxygen - we would use on the order of 250 gallons of liquid per day; when converted to gas this is about 30,000 cuft per day ****

QUESTION: WESTON has also been informed that the current hydrogen peroxide/UV system in operation in the vicinity requires "shipments via truck every three to four days of sulfuric acid, sodium bisulfite, caustic and hydrogen peroxide in 20-ton lots". Can you provide a similar rough estimate of other supply requirements for your proposed hydrogen peroxide/ozone treatment system?

**** the HiPOx system has three consumables, electric power, oxygen, and hydrogen peroxide.

The oxygen use would indicate that (depending on how large the liquid O2 tank) one delivery every 3-4 weeks would be required The hydrogen peroxide use is about 35 gallons per day(of 35% solution); the on-board peroxide tank for a system like this would be sized so that you could go about the same 3-4 weeks.

The sulfuric acid is used to lower pH of the influent water in UV systems to help their overall economics, and and sodium bi-sulfate is used to nuetralize residual hydrogen peroxide. The HiPOx system does not require pH adjustment, and the HiPOx dischage has much lower residual hydrogen peroxide than a comperable UV system. The low level of hydrogen peroxide residual can be handled with a GAC bed following the HiPOx to act as a catalyst for hydrogen peroxide decomposition... the GAC is not consumed in this process so there is no operating cost to consider, but the capital cost for a carbon bed was not included in the capital cost estimates.*****

Influent/Effluent Equalization Ponds - It has been suggested that both influent and effluent equalization ponds are necessary for proper operation of system. This requirement would significantly increase the space requirements "System Footprint" for the treatment system.

Based on the limited data on the quality of the influent groundwater (WESTON has no data related to iron content, or other characteristics, of area groundwater), APT does not believe that an equalization influent pond for the precipitation of iron prior to treatment is necessary for the proposed hydrogen peroxide/ozone treatment system. Although APT has not treated groundwater with extremely high iron content, they have successfully treated groundwater with iron contents in the range of 15-20 ppm utilizing their hydrogen peroxide/ozone treatment system without problems with the iron precipitation.
APT indicated that hydrogen peroxide/ultraviolet treatment processes are more susceptible **** to performance problems related to iron precipitation since they depend on the optical quality of the water, where the HiPOx process is an aqueous phase chemical reaction not dependent on water clarity.*****

QUESTION: The influent groundwater for the proposed system will be derived from two source areas which will be combined upstream of the treatment unit. The estimated 1.4-dioxane concentrations and flow rates of two streams are approximately 85 ppb and 650 gpm, and 1,200 ppb and 650 gpm, respectively, from which we derived our combined influent stream (570 ppb at 1,150 gpm). Is it possible that an influent equalization pond may be necessary or recommended to account for the variations in concentration of the two influent streams (variations in 1,4 - dioxane concentration as well as general water chemistry)? While the two streams are combined upstream of the treatment system and continuous contribution from both streams is planned, the mixing of the two streams probably should not be considered complete. In addition, could the treatment system handle variations in the influent concentration (or what is anticipated effort to handle this condition)? For instance, what if the 85 ppb stream is cut off so that the influent stream is now approximately 1,200 ppb and 500 gpm? **** The HiPOx system can be supplied with a small (4-5 minute residence time) influent tank that can allow the streams to mix. With two streams with different treatment requirements, the simplest and safest thing

would be to treat the entire stream as if it were the highest concentration stream (in this case 1200 ppb), which would increase the operating cost. Another approach would be to add interlocks so that if the low concentration stream is not flowing, the system shuts down so as not to undertreat the highly contaminated stream, until the well is brought back on line, or the system can be "re-tuned" to treat highly contaminated water .*****

If has been suggested that influent/effluent equalization ponds may be necessary to provide assurance that effluent discharge requirements and restrictions (flow and quality) can be met. Estimated discharge requirements/restrictions are not known at this time. However, APT estimated downtime associated with normal operation and maintenance issues of the proposed system is limited to approximately 2-5% over a period of continuous operation based on past experience with operation of their hydrogen peroxide/ozone treatment systems. Although dependence upon the unknown effluent discharge requirements/restrictions will likely be significant, it does not seem likely that either influent or effluent equalization ponds would be required to account for variations in effluent conditions resulting from the limited predicted downtime associated with normal system operation and maintenance issues. APT did indicate that the predicted downtime applied to operation of the system after its start-up period, which could be considerable, and also did not include account for "catastrophic" failures (i.e.. equipment component failure, power outages), which also may be considerable depending on the cause of the failure. However, in the event of a "catastrophic" failure of the treatment system, groundwater recovery operations could be discontinued until the treatment system is on-line (1 - 2 months) without significant consequence because of the relatively slow rate of contaminant migration along with groundwater flow. ***** Anne - the last half of this section reads a little odd; too much focus on catastrophic failures! If it is required that water be pumped 100% of the time to keep the plume from expanding, then some provisions for water storage would be required. If a few days down can be tolerated, ponds could probably be avoided with some up-front design work; the first thing that comes to mind would be redundent ozone generators (the only real long lead items). We could put in 3 each 50% sized units so that if one failed you could still run 100% capacity while fixing the damaged unit.*****

Thanks again for your help and I would appreciate your response to my additional questions.

Anne

-----Original Message-----
From: Peter Herlihy [mailto:PHerlihy@worldnet.att.net]
Sent: Monday, June 21, 2004 10:01 PM
To: Turner, Anne
Subject: RE: Applied Process Technology, Inc. Preliminary Proposal 1366

Anne – I wouldn't call them mobile, but easily mobilized is a fair description.

Depending on which of the below systems under consideration, the equipment would be housed in two modified shipping containers, combinations of 40 ft x 8 ft x 9 ft high or 20 x 8 x 9. Typically they are lifted off flatbed by crane and set on concrete pad. You could keep them on the flatbed (i.e., buy or lease the flat bed for extended periods) and in that mode they would be mobile. You need an Oxygen source, (bulk tank and vaporizors) which are usually on a concrete pad as well.

Peter

-----Original Message-----
From: Turner, Anne [mailto:Anne.Turner@WestonSolutions.com]
Sent: Monday, June 21, 2004 10:27 AM
To: Peter Herlihy
Subject: RE: Applied Process Technology, Inc. Preliminary Proposal 1366

Peter

Thank you for your prompt response. The information is great.

A couple more quick questions: 1) Are these mobile units? Can they be mobile? 2) What are dimensions of units?

Thanks.

-----Original Message-----
From: Peter Herlihy [mailto:PHerlihy@worldnet.att.net]
Sent: Saturday, June 19, 2004 10:45 AM
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Cc: Doug Liddie; Trixie Mardo
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Sincerely,

Peter Herlihy
Manager, Eastern Region
Applied Process Technology, Inc.
Phone 513 759 5333

Cell 513 476 5600