Advice & Counsel

Frank Altmayer, MSF, AESF Fellow
AESF Technical Director
Scientific Control Labs, Inc.
3158 Kolin Ave.
Chicago, IL 60623-4889
E-mail: faltmayer@sclweb.com

Eductor 101

Dear Advice & Counsel,
I have a very simple question. What is an eductor and how can it provide an advantage in our plating operation. We are a captive hard chromium plating facility and we have heard about these devices from some friendly competitors, but even they are not using them.

Signed,
Barely Agitated

Dear Ms. Agitated,

Eductors are devices used to amplify water flow by a venturi effect. Fig. 1 is a photo of this device and Fig. 2 is an illustration of an installation from one of the suppliers of these systems. While the most common eductors are made of PVC, they also are made from a number of other materials including cast iron and stainless steel.

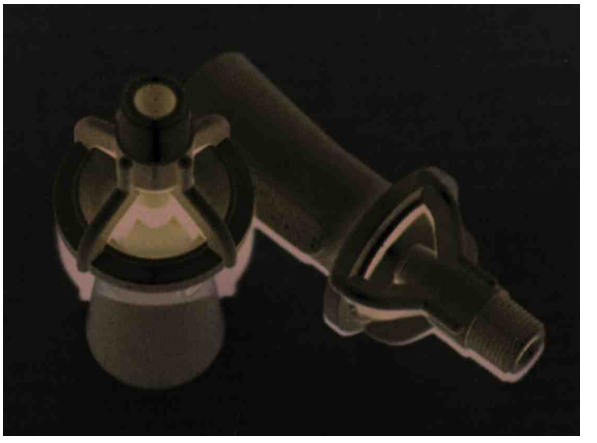
Eductors can effectively and more uniformly agitate a process tank without producing aerosols. Process tanks are typically equipped with a bank of eductors specifically designed to provide a uniform movement of liquid. This uniform solution movement is accomplished without the production of undesirable aerosols. Further, eductors can improve the quality of electroplated deposits by improving plating uniformity across racked parts on a work bar. Eductors can eliminate or reduce the cooling effect of air blower agitation, minimize brightener breakdown caused from oxidation by air, and reduce the introduction of dust and vapor into the solution.

Additional benefits eductors may provide are:

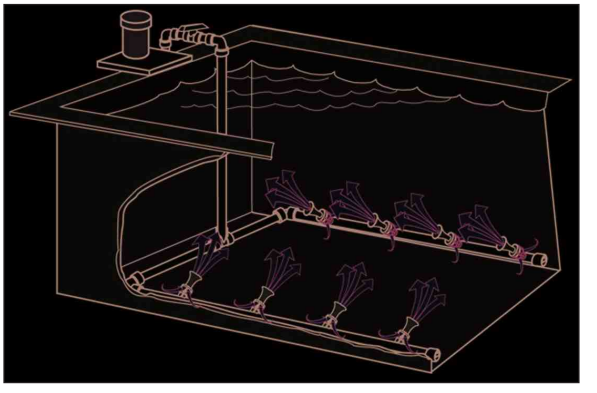
- More even plating distribution
- Reduction of thermal stratification
- Reduced air emissions
- Reduced tendency to pit in some solutions
- 25% energy reduction in heated tanks
- Operation at higher current densities
- Improvement in throw/coverage
- Broader bright range, lower brightener consumption
- No air blower (less noise)
- No clogged spargers producing non-uniform or absent agitation

The above sounds one-sided, but there are a few disadvantages that must be considered:

- Eductors take up more tank space than an air sparger
- The material of construction for the eductor must withstand the chemicals in the tank
- An electric motor/pump is required to drive an eductor system. With multiple systems, energy costs may increase.
- The mechanical force of the liquid may sometimes cause parts to sway in the tank. This can usually be worked around by the installation design.



Eductors are used for agitation in process tanks.



This illlustration shows how an eductor works. (Courtesy of SERFILCO, Lid., Northbrook, IL.)

Potential uses for eductors are:

Cleaners

Alkaline cleaners function through the use of thermal, chemical, and mechanical energy. By increasing any of these three forces, the efficiency of the cleaner is likewise increased. By replacing recirculating pumps or air agitation with an eductor system, the level of mechanical energy applied to parts is significantly increased.

With eductors, there also is less contamination of rack superstructure and contamination of portions of parts protruding from the solution. During my visit to your facility, you indicated that some parts were rejected due to "rundowns". This is where

(Continued on page 31)

the age of 50 is less than 2 percent (1 in 50), before the age of 60 the risk is 4.24 percent. Her total risk of death before 65 in 1.5 percent (1 in 65).[10]

Murray *et al* add the following: "*Los Angeles Times* media critic David Shaw has observed that in 1993 about 46,000 American women died of breast cancer, and about 38,000 American men died of prostate cancer. Yet breast cancer was mentioned almost 5,800 times in major magazine and newspaper stories in 1993, compared with fewer than 1,800 mentions for prostate cancer. In other words, breast cancer received 233 percent more attention from the media. Significantly, the greater media attention given to breast cancer correlated with far more government funding for breast cancer research. In 1993, the National Cancer Institute earmarked $213 million for breast cancer research, compared with only $51 million for prostate cancer research. As Shaw pointed out, this 418 percent difference is much closer to the relative media coverage of the diseases than to the relative number of deaths.[9]

Even EPA folks can get carried away by the numbers game. John Brignell observes: "During a speech at a conference sponsored by the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, Mary Nichols, EPA's assistant administrator for air and radiation, claimed that the EPA's proposed air pollution standards for ozone and particulate matter would save (hang on to your hat) 58 million lives. You may wish to be reminded that 2 million Americans die every year from all causes. I stand to be corrected but I think that this qualifies for the Guinness Book of Records."[11]

Summary

Tammy Bruce describes in detail her efforts as a publicist in helping a firm who was having a "product brand anniversary coming up and wanted the news media to cover it not as a corporate event but as news".[12] Every television news station in the country was sent a fax that made a pitch about the event along with information for downlinking video footage. This was followed by a personal call to the assignment editor at each network station in the top 50 television markets. The project was a success. The video aired in almost every one of the top 50 markets in the nation. Here's the important point that Bruce drives home. "This may seem to you especially blatant—pitching a product as news. But consider the way protests and demonstrations by special-interest groups are arranged exclusively to receive media coverage. What is pitched is different—a product versus an issue—but the method is the same. In each case, the critical thing is not to let the public know how it is done."[13] ***P&SF***

References

1. John Stauber and Sheldon Rampton, *Toxic Sludge Is Good For You*, (Monroe, Maine, Common Courage Press, 1995), 2.
2. Douglas Powell and William Leiss, *Mad Cows and Mother's Milk*, (Montreal, McGill-Queen's University Press, 1997), 231.
3. Sheldon Rampton and John Stauber, *Trust Us, We're Experts*, (New York, Penguin Putnam, 2001), 22.
4. Dean Edell, *Eat, Drink & Be Merry*, (New York, HarperCollins Publishers, 1999), 31.
5. Elizabeth M. Whelan and Fredrick J. Stare, *Panic in the Pantry*, (Buffalo, New York, Prometheus Books, 1992), 2.
6. David Fenton, "How a PR Firm Executed the Alar Scare," *The Wall Street Journal*, October 3, 1989, Page A22.
7. James P. Collman, *Naturally Dangerous*, (Sausalito, California, University Science Books, 2001), 3.
8. David Shaw, *The Pleasure Police*, (New York, Doubleday, 1996), 24.
9. David Murray, Joel Schwartz and S. Robert Lichter, *It Ain't Necessarily So*, (New York, Rowman & Littlefield Publishers, 2001), 119.
10. Brian Lomborg, *The Skeptical Environmentalist*, (New York, Cambridge University Press, 2001), 224.
11. John Brignell, *Sorry Wrong Number!* (Great Britain, Brignell Associates, 2000), 217.
12. Tammy Bruce, *The New Thought Police*, (Roseville, California, Prima Publishing, 2001), 195.
13. Tammy Bruce, *The New Thought Police*, 196.

Advice & Counsel

(Continued from page 28)

mist or splashes from the cleaner collect on the portion of the parts that reside out of the cleaner (parts are only partially submersed). During subsequent plating processes, the cleaner runs down the part and causes a streak in the plated deposit.

Plating/Anodizing Processes

Hard chromium platers that have switched from air agitation to eductors to maintain tank temperature have provided me with favorable comments on the effect. A nickel plater that replaced air agitation with an eductor system reported a dramatic reduction in air emissions and an improvement in plating speed and distribution.

Eductors may improve most any plating process that requires vigorous agitation. An exception may be processes such as acid zinc plating, where air agitation is required to control the iron content.

Eductors may also improve anodizing quality and speed by providing a higher level of mechanical force.

Acid Pickling

The efficacy of an acid can be improved by adding agitation. If the eductor is used to replace air agitation, less fumes and mist will be produced.

Rinsing

I have always had a poor opinion of air agitated rinses, because too often the air comes up in one corner of the tank and the rest of the tank is "dead". Eductors provide a much more effective level of agitation and are not subject to the clogged sparger syndrome.

A word of caution: Always discuss a change in the method of agitation of any plating or anodizing process with your supplier or consultant, before investing in such a change. At times, an eductor system may require a change in additive package (especially wetter) to avoid an undesirable change in appearance. ***P&SF***