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THE FUTURE OF VAPOR DEGREASING WITH CHLORINATED SOLVENTS

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Chlorinated solvents can be used in the future. Only CFC's and 1.1.1 Trichloroethane are phased out. Parts cleaning with chlorinated solvents in an ultra-tight cleaning system is the most economic and environment friendly solution for high quality applications.

This article provides users of OTVD (Open Top Vapor Degreasers) which use CFC's or 1.1.1 with a new and, for over 10 years in Germany, proven solution to their parts cleaning problems.

BACKGROUND

The environmental laws and regulations in Germany have been very tight for over 10 years. The reaction in the industry was similar in the United States now.

Many people hoped they could find the perfect cleaning process, 100% environmentally friendly, economic and with a high cleaning quality. But the dream that aqueous cleaning would be the best solution for all cleaning applications was not fulfilled.

As a result, cleaning with chlorinated solvents in ultra-tight vapor degreasing systems is still the best cleaning solution for high quality cleaning.

The industries and the environmental agencies recognized that not what you use as a cleaning medium, but how you use it, is a major factor for our environment. Therefore, emission reduction and waste minimization are the main problems to be addressed.

PERFECT PARTS CLEANING

The perfect parts cleaning solution is the process which meets all of the following requirements.

The cleaning medium should be truly environment friendly. No cleaning medium can achieve this, because everything has an influence on our environment. If we use a water based cleaning system we cannot send the waste water directly into the environment. It is still perhaps legal to do this, but the damage to the environment and the cleanup costs for your company should make you think twice before you do so.

The cleaning medium should remove all types of contamination. No medium can accomplish this, especially aqueous systems which are very limited in their use. Chlorinated solvents have a clear advantage in this area and it is often possible to have one system with one type of chlorinated solvent for all your applications.

The major task for your company is to obtain an excellent and consistent cleaning quality with your parts cleaning system. Chlorinated solvents are also leading in cleaning quality, especially if oil or greases are contaminations. The consistence of your cleaning results depend on the ability to recover the contamination from your medium. This is much easier with chlorinated solvents than with anything else. You heat the solvent up and produce a vapor which is 100% oil free and provides you with consistent cleaning results.

The most important factor for perfect parts cleaning is the cleaning system itself. Your main concern is whether it is cost effective and gives you the lowest cost per part cleaned. For high quality parts, cleaning with the ultra-tight vapor degreasing system using chlorinated solvents is clearly the most economic solution.

An easy to operate system gives you the assurance that operator errors will not jeopardize your cleaning quality and will not cause injuries. Fully automated systems and sophisticated safety features are the basic things which can provide this.

Your new system has to be in accordance with the EPA. Ultra-tight vapor degreasing systems are by far better than all standards and regulations from the EPA. Their emission and waste minimization[1] program talks mainly about old open top vapor degreasers and retrofits to reduce their emissions. With an ultra-tight system you are one big step ahead.

Low energy consumption is a main factor in how environmentally friendly your system really is, and also has some influence on your costs. Aqueous systems need by far the most energy for parts cleaning, especially for the drying cycle. This is a major factor which is mostly forgotten about

when cleaning systems are judged to see how environmentally friendly they are.

The system should only generate a low and controlled waste stream. The waste stream from ultra-tight cleaning systems with chlorinated solvents has the lowest amounts possible. Solvents are tracked with a complete paper trail. Therefore, illegal dumping and later cleanup costs and scandals are only a threat when you use other cleaning mediums, which are not closely monitored.

Low emission in the work area and stack emissions are required for all cleaning systems. Water systems which are not completely enclosed are not environmentally friendly. An ultra-tight system with chlorinated solvents which releases less than 1 lb a year and gives you less than 10 ppm in the work area is better for the environment and your employees.

The safety of the system is determined through different factors, including the machine, the medium, the operator training and many other things. The safest mediums are aqueous based solutions. However, the safety features of an ultra-tight degreasing system gives you an overall cleaning system which is as safe as or better than a water based one.

If you look at all the possibilities and requirements, you will see that no cleaning system, or medium gives you the perfect parts cleaning solution for all cleaning tasks.

CLEANING POSSIBILITIES

The three main cleaning processes are aqueous, hydrocarbon and chlorinated solvents. Aqueous cleaning systems are mainly dip tank, spraying systems or combinations. They are good solutions for easy cleaning tasks, where only one type of material is involved and the parts do not require high quality cleanliness.

Hydrocarbons are only used in some special applications. Their biggest drawback is that they are flammable and therefore a safety hazard for the company.

Chlorinated solvents are mainly used in Open Top Vapor Degreasers (OTVD). Future use of chlorinated solvents requires ultra-tight vapor degreasers. Chlorinated solvents are an excellent solution for difficult cleaning tasks, where different materials are involved and a high quality cleanliness is required.

Parts cleaning with chlorinated solvents provides the following advantages:

a. It is the most economic parts cleaning process for high quality cleaning applications. Parts which must be 100% grease and oil free and spotless after drying are examples for high quality tasks. Blind holes and bulk parts are also more economically cleaned with chlorinated solvents.

b. Cleaning with chlorinated solvents is environmentally friendly through ultra-tight systems which reduce emissions and the waste stream drastically.

c. Chlorinated solvents can be used now and in the future. The three solvents which are not phased out are Methylene Chloride, Trichloroethylene and Perchloroethylene[2]. They are not phased out because they do not have the ozone depletion potential as CFC's or 1.1.1 Trichloroethane.

ULTRA-TIGHT VAPOR DEGREASING SYSTEMS (UTVD)

The main tasks of these systems are waste and emission reduction and improved parts cleaning. Some of the technical details of an UTVD are the work chamber system, filter arrangement and the safety floor pan (Figure 1). An UTVD has the following advantages versus other cleaning systems:

a. Parts rotation gives you parts which are chip free and also drains the solvent residues off your part.

b. Three different tanks in one unit are possible which provide a better cleaning quality and consistency. It also reduces solvent usages because all oil and grease are collected in one tank.

c. Recycling of the solvent in the system improves the cleaning quality and reduces the waste stream.

d. The filter system for chip removal can be adjusted to your requirements and is easy to access.

e. The system is fully programmable and therefore the optimum cleaning cycle can be chosen for each application.

f. At the end of each cleaning program a drying cycle is incorporated.

Therefore, all the parts are solvent free and dry when they leave the system.

g. Waste minimization is achieved through internal and external recycling of the solvent. The PLC control tells the user when the external recycling is required.

h. All emissions, stack emission and work area emissions, are reduced to levels which are acceptable for the environment and your employees[3]. Stack emissions (Figure 2) are 30 g solvent per hour or even 20 mg/m³ if required. The work area emissions (Figure 3) are less than 10 ppm with any solvent used.

i. Special safety features give you even more advantages when using ultra-tight cleaning systems. The door to the working chamber will not open if there is any solvent left in the chamber. In addition, the door only opens when less than 1 g of solvent per m³ air is present in the work chamber. All processes are controlled by a PLC and the system shuts down automatically if any malfunction occurs.

j. An ultra-tight cleaning system is also more economic than OTVD. The machine can be fully automated so therefore no operator is required.

k. A higher throughput can be achieved through optimized cleaning programs for each application and consistent cleaning cycles which do not

l. depend on operator judgment.

Lower costs per part cleaned result from lower operating costs, especially lower operator costs and less solvent loss.

ENVIRONMENT FRIENDLY

What is an environmentally friendly cleaning system?

If you define an environmentally friendly process as a process which has no negative influences on the environment, no cleaning process can achieve this.

Mr. Erbel stated during a Cleaning Seminar[4] "the idea of environmental protection is genuinely served only if the total volume of any emitted substance be eliminated or kept as low as possible."

Every cleaning process has an influence on our environment. Keep in mind that

THE BEST CLEANING IS NO CLEANING!

Your main task is to classify your parts in respect to their different cleanliness requirements. If you use a so-called environment friendly or biodegradable cleaner, be aware that you deposit the machining fluids and contaminations in the immersion tanks and therefore the chemistry will change.

Some of the new cleaning products and solvents may even be more dangerous than the old ones. The long term effects are unknown and the regulations, emissions and work area limits are wide open.

How much you release into the environment is a main factor. It depends upon the dosage if something is healthy or lethal. Therefore, the main question is not what you use, but how and how much waste and pollution you generate.

One other problem I see is careless handling. The excessive use and waste of CFC's in OTVD and other units had to have consequences. New ultra-tight cleaning equipment, tougher regulations, regular control and a complete paper trail will assure the best possible, environmentally friendly use of chlorinated solvents. Substances which are not regulated are handled less carefully and are therefore a bigger risk to our environment.

ULTRA-TIGHT VAPOR DEGREASING SYSTEMS

By switching from an OTVD to an ultra-tight cleaning system, you will not generate a waste water problem. The only emissions you have are air emissions in the work area and stack emissions.

Stack emissions of less than 20 mg solvent per m³ air are possible. Work area emissions of less than 10 ppm are achieved, regardless of which solvent is used.

The main step in waste minimization is a closed loop solvent system. We work together with a major solvent supplier which enables the user to operate their machine with recycled solvent. Two solutions are possible: in-house recycling or recycling through the vendor.

The in-house option is more economic if large amounts of oils accumulate in the system. The main task however is to minimize the contaminations on your part before the cleaning. This is because everything you deposit in the system, you have to recover again. Less oil on your parts will therefore save you oil disposal or recycling costs and is better for the environment.

All chlorinated solvents are tracked by an accurate paper trail. It is additional work but it gives your company the assurance that no environmental hazards are generated by your cleaning system.

Ultra-tight vapor degreasing systems are the best overall environmental solutions for high quality cleaning applications. If you have a high quality cleaning application and you can achieve the cleaning result with an aqueous or solvent based system (which is very seldom the case), the solvent system uses less than one third of the energy of the aqueous system. That means one third CO_2 emissions and a large environmental advantage of solvent against water (Figure 4).

THE BEST CLEANING PROCESS FOR YOUR APPLICATION

The best cleaning process will provide you with the best overall solution in regards to economic, environment and cleaning quality. Based on the information and test results you received, you have to decide which process is the best for you.

The first step to find the best cleaning process for your application is to analyze your needs. Avoid cleaning your parts if possible, classify cleanliness levels and ask at least four or five companies with different cleaning solutions for their opinion.

Test cleaning of your parts is the second step. To purchase a cleaning system without test cleaning is very uncommon. Only tests can give you and the supplier the basic information: is the cleaning process usable for your application ?

Our basic rule is that low quality cleaning applications are more economically and environmentally friendly cleaned with aqueous systems. For increasing cleaning quality and more difficult cleaning applications, ultra-tight cleaning systems with chlorinated solvents are more economic[5,6] (Figure 5) and better for the environment.

SUMMARY

Look at all the options when you search for a cleaning solution. If your company policy limits you to aqueous, think again!

Ultra-tight cleaning systems with chlorinated solvents are a proven solution for over 10 years in Europe. Base your decision for a cleaning system on facts, not on rumors and politics.

There is no cleaning system which is the best for all applications. Your parts, contaminations and cleanliness requirements are the main factors which influence what system is the best overall cleaning solution for you.

CONCLUSION

The cleaning properties of chlorinated solvents cannot be substituted by aqueous cleaners.

High quality cleaning with an Ultra-Tight Vapor Degreasing System is more economic and better for the environment than aqueous systems.

The era of OTVD is over and ultra-tight systems will be used instead.

In my opinion, Vapor Degreasing with chlorinated solvent in UTVD is, and will be, one of the best cleaning solutions in the future.

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Heinz-Dieter Erbel,
Pero KG, Koenigsbrunn, Germany

Figure 1
Function scheme of an UTVD

- Air system ——
- Work chamber system — —
- Solvent system ——

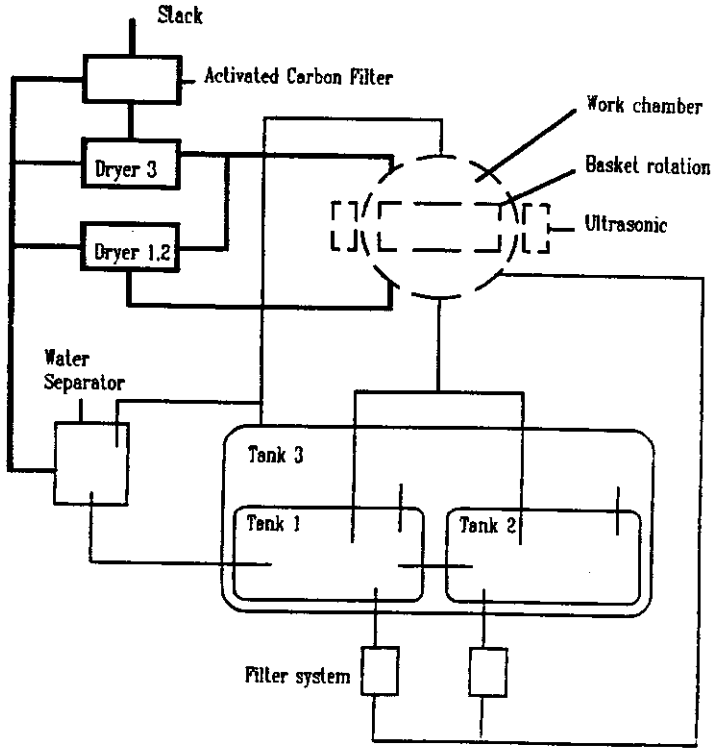


Figure 2

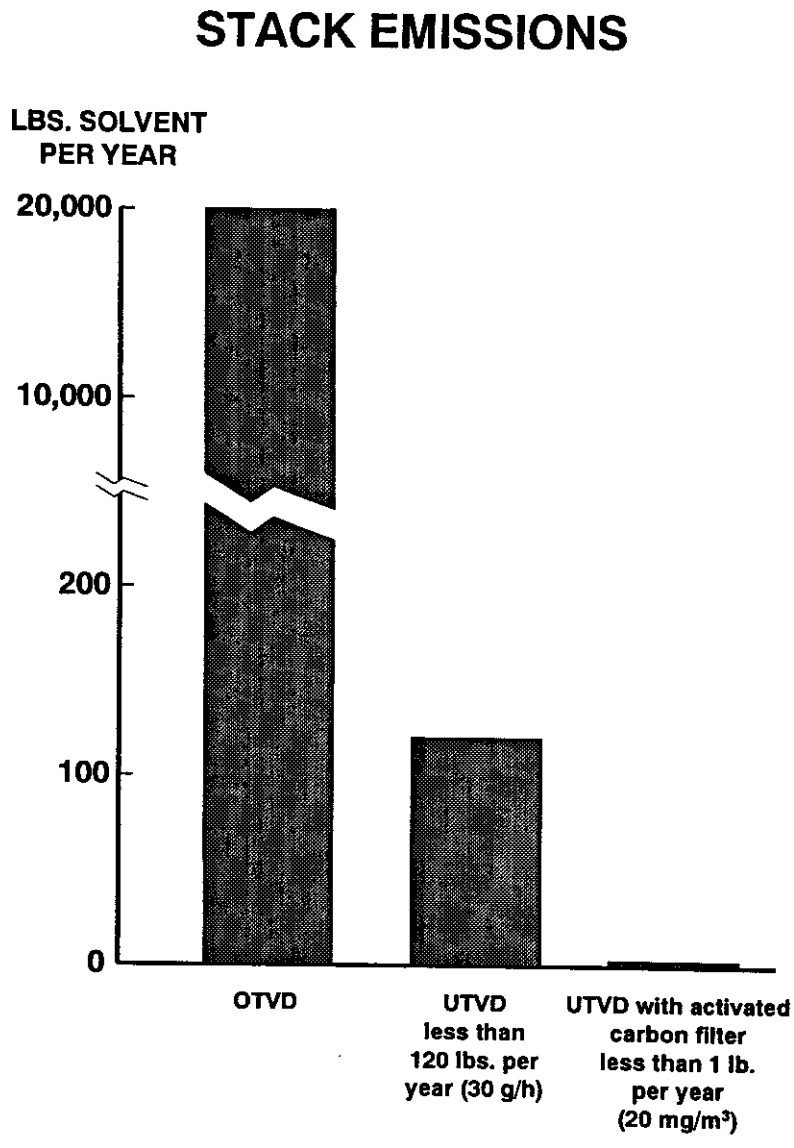


Figure 3

WORK AREA EMISSION

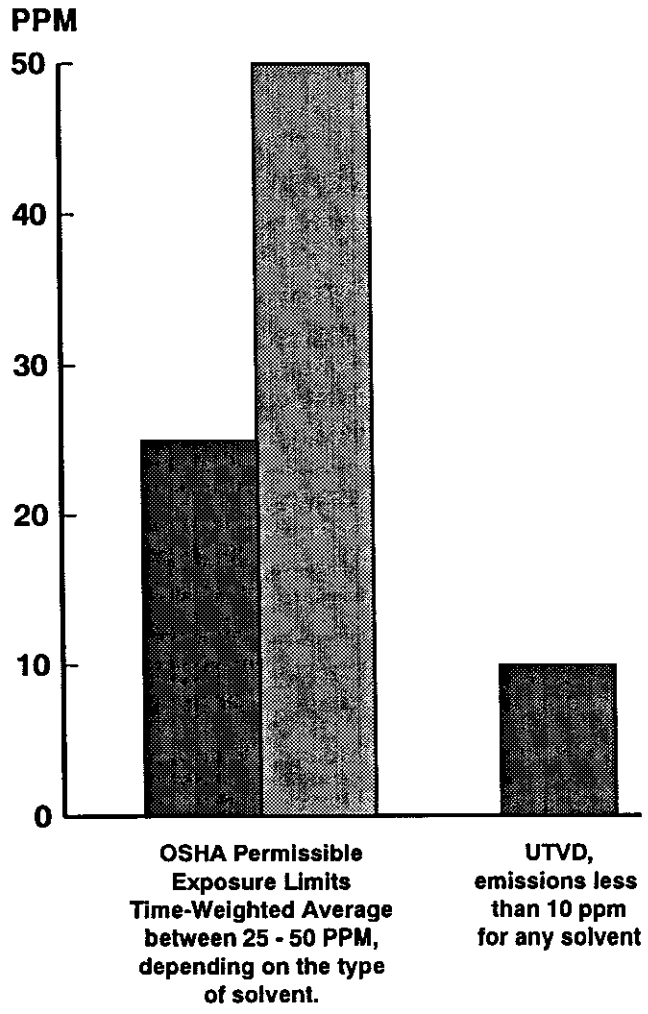


Figure 4

EMISSION COMPARISON BETWEEN AN AQUEOUS SYSTEM AND A UTVD

(Based on 1000kg of material cleaned in one operating hour)

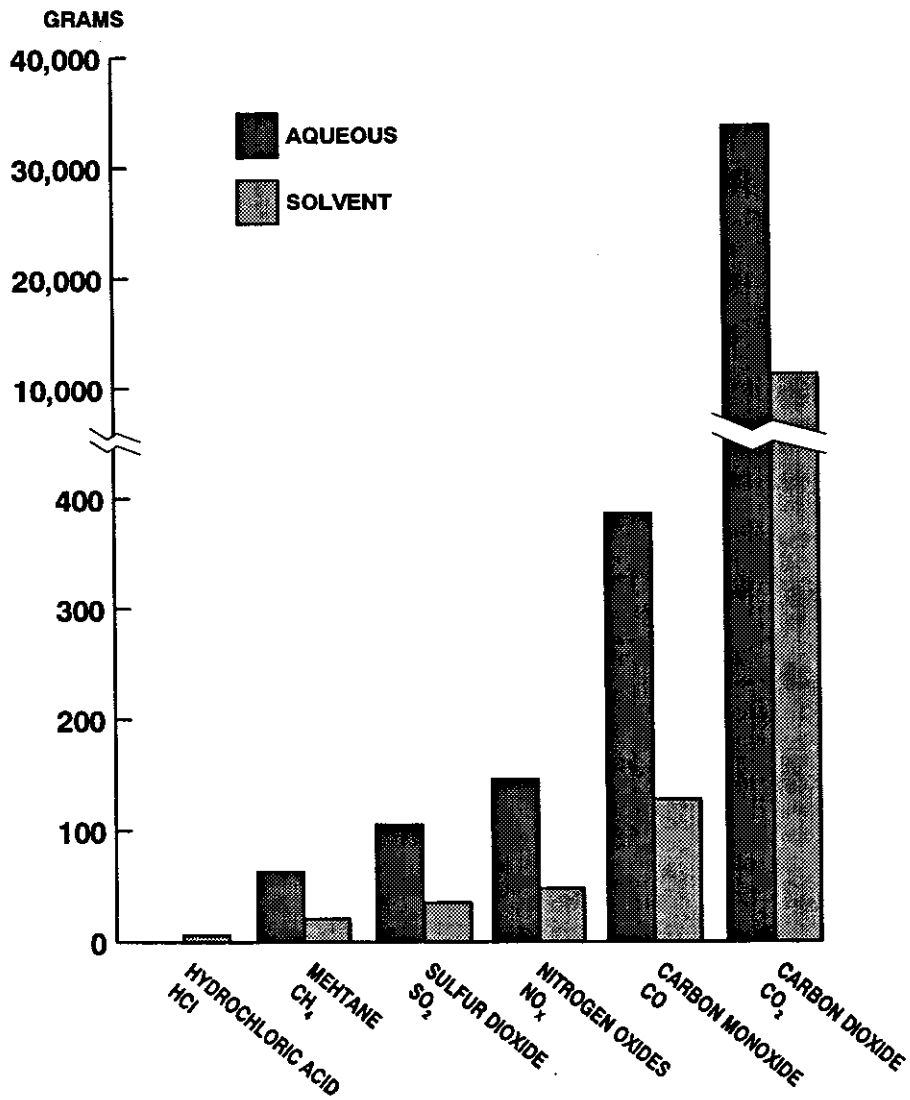
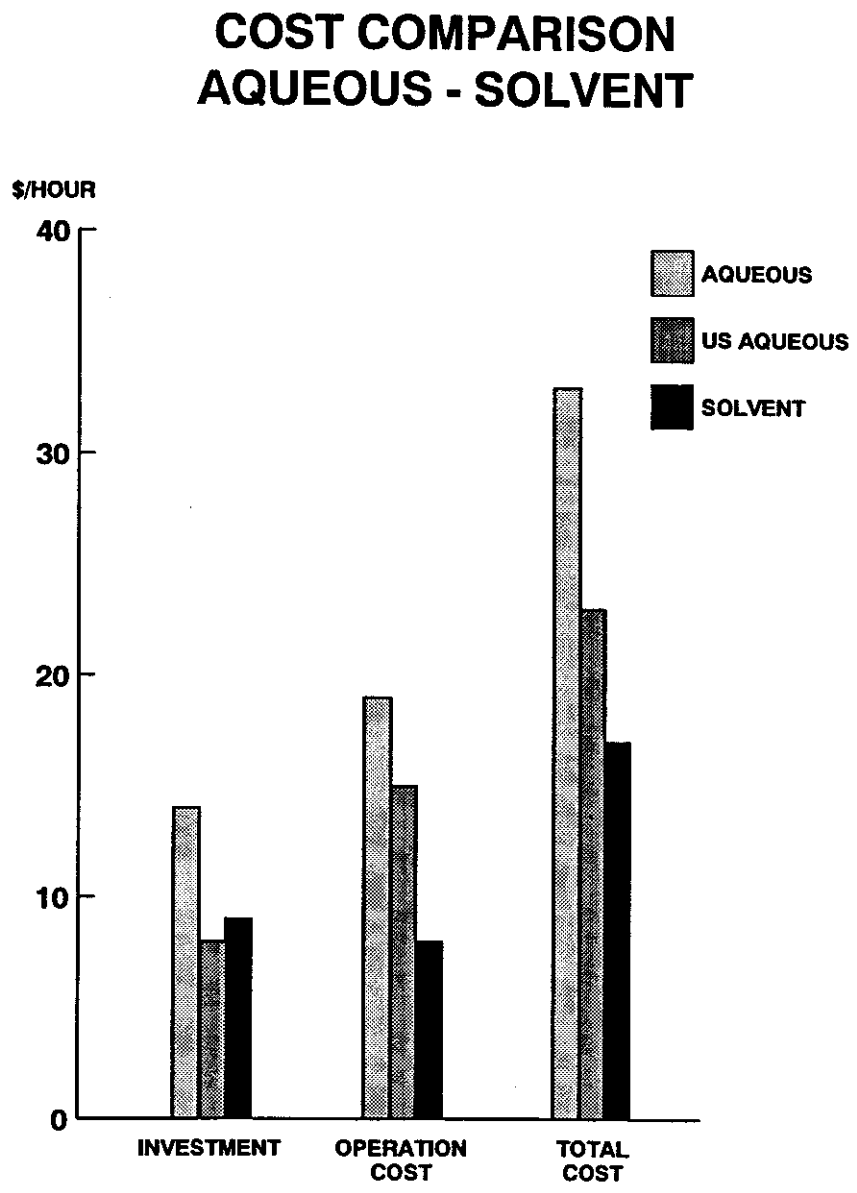


Figure 5


COST COMPARISON
AQUEOUS - SOLVENT
$/HOUR
40
30
20
10
0
AQUEOUS
US AQUEOUS
SOLVENT
INVESTMENT
OPERATION COST
TOTAL COST