THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

U.S. Environmental Protection Agency

Concurrent Technologies Corporation

ETV VERIFICATION STATEMENT

TECHNOLOGY TYPE:	**ENERGY CONSERVATION**		
APPLICATION:	**TANK LID COVERS**		
TECHNOLOGY NAME:	**The Automated Covered Tank System for Energy Conservation**		
COMPANY:	**KCH Services, Inc.**		
POC:	**Rick Hall**		
ADDRESS:	**144 Industry Drive** **Forest City, N. Carolina 28043**	**PHONE:** **FAX:**	**(828) 245-9836** **(828) 245-1437**
E-MAIL:	**rdotyhall@aol.com**		

The United States Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved, cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized standards and testing organizations, and stakeholder groups consisting of buyers, vendor organizations, states, and others, with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are credible.

The ETV Metal Finishing Pollution Prevention (P2) Technologies (ETV-MF) Program, as part of the ETV Pollution Prevention, Recycling and Waste Treatment Center, is operated by Concurrent Technologies Corporation, in cooperation with EPA's National Risk Management Research Laboratory. The ETV-MF Program has successfully evaluated the performance of several innovative Metal Finishing P2 Technologies. This verification statement provides a summary of the test results for the KCH Services, Inc. Automated Covered Tank System for Energy Conservation (ACTSEC).

VERIFICATION TEST DESCRIPTION

The KCH ACTSEC technology was tested, in an idle mode, at Goodrich Aerospace Landing Gear Division in Tullahoma, Tennessee. The system of lids on each tank is designed to reduce the overall ventilation required to meet the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines for pollutant exposure in the workplace. This correlates to a reduction in the size of the scrubber, scrubber pump motor, and induced draft fan, lower energy costs, and ultimately less pollution from power plants generating the energy. The verification test evaluated the ability of the KCH ACTSEC to reduce the ventilation and heater power load as compared to a baseline system design without the lids.

For the technology verification, key measurements were taken during seven tests noted below.

- The first test evaluated the technology based on heater power consumption with lids open.
- The second test evaluated the technology based on heater power consumption with lids closed.
- The third test evaluated the technology based on scrubber pump motor power consumption.
- The fourth test evaluated the technology based on power consumption of the lid motors.
- The fifth test evaluated the technology based on power consumption of the induced draft fan.
- The sixth test evaluated the technology based on ventilation specified in the original design.
- The seventh test evaluated the technology based on static pressure specified in the original design.

TECHNOLOGY DESCRIPTION

The KCH ACTSEC technology is a system designed to provide an efficient removal of air contaminants from the workplace at a reasonable cost and at a level that minimizes the overall power consumption and exhaust volume to the air pollution control device. This installation is set up as one semi-automated process control system. The process is wash and etch of titanium parts. The lids and exhaust are automated. All vented tanks are fitted with covers that open and close as the hoist moves over the tank to load or unload parts for washing or etching. The line is exhausted via its own exhaust system, comprised of a scrubber and fan.

Each vented tank has two lateral exhaust hoods, each with its own volume damper. The volume dampers are interlocked with tank covers and open and close at the same time. This allows for an increase in airflow through the hoods as required when the covers are in the open position.

The exhaust system has a bleed-in air control damper, located between the line hoods and the scrubber, that opens and closes as required to compensate for the fluctuation in static pressure due to the opening and closing of tank covers and hood dampers. This maintains a constant volume and static pressure through the scrubber and fan.

The system provides a constant volume with a slight negative airflow in the room. Makeup air is brought in from the outside, tempered, and distributed throughout the room.

VERIFICATION OF PERFORMANCE

The KCH ACTSEC technology was tested to verify if the statements made by the vendor as to the energy savings from decreased power requirements were accurate. Energy was consumed by the scrubber pump motor, induced draft fan, lid actuator motors, and the immersion heaters. These are all components of the KCH ACTSEC technology. The scrubber pump motor operates continuously along with the induced draft fan motor due to ACGIH ventilation requirements. The lid motors are operated when it is necessary to enter or exit a tank, and the immersion heaters operate automatically to maintain a set temperature in the baths. The induced draft fan was tested for power consumption, and the induced draft system was tested for flow and static pressure.

The measured data from the verification test compared to equipment nameplate data is illustrated in **Table i**. The nameplate data for the amperage for the various motors is a full load value. The data for the amperage is lower in most cases. The only exception is the scrubber pump motor, which may indicate a need for maintenance. Nearly

all amperage data is within 75 percent completeness (percentage of valid measurements compared to total number of measurements). Only the completeness for the lid motor data is outside the specified 75 percent when compared to the nominal value. However, CAMP verified that the motors for the lids were rated for a 500-lb load but are only driving a 350-lb load. This decreased load results in lower power consumption than nameplate data for the motors. At 70 percent of nominal, based on partial loading of the motors, the data is within 75 percent completeness. One heated tank was tested. The wash tank was operating at a temperature sufficient, even with insulation, to cause the immersion heaters to cycle on and off in just over one hour. The remaining hot rinse and etch tanks were operating at a temperature very near ambient. A long heater cycle time for these tanks prohibited testing. The measured flow rate of 18,150 CFM is a reduction of 31,970 CFM from the baseline design flow rate of 50,120 CFM for a tank system without lids.

ELECTRICAL

ITEM	Nameplate Volts	Nameplate Amps	Actual Volts	Actual Amps	Energy Consumed kWh./Year
Immersion Heaters – Lids Open	**480**	**86.7**	**486**	**79.0**	**1,076,429**
Immersion Heaters – Lids Closed	**480**	**86.7**	**489**	**80.1**	**1,010,393 ***
Lid Motors (911 Tank)	**110-120**	**4.6**	**119**	**3.3**	**3 ***
Scrubber Pump Motor	**480**	**2.1**	**484**	**2.6**	**21,671**
Induced Draft Fan Motor	**480**	**34.9**	**486**	**30.8**	**306,044**

*** Figure considers annual part throughput.**

VENTILATION

ITEM	Nameplate Data	Value
Flow Rate	**17,612 CFM (KCH Design)**	**18,150 CFM**
Static Pressure	**5.5• wg**	**6.08• wg**

Table i. Summary of Key Analytical Data

Operation and Maintenance Labor. Operation and maintenance (O&M) labor requirements for the KCH ACTSEC technology were not monitored during testing. However, O&M information obtained from the facility indicated yearly O&M costs were $8,547.

Cost Analysis. Cost analysis of the KCH ACTSEC technology was performed using current operating conditions. The reduction in the size of the scrubber and the induced draft fan due to the lower ventilation requirements with the lids in use results in a lower cost for equipment and power requirements. The reduction in the size of the induced draft fan is significant. The facility anticipates a saving of $65,884 annually, which is comprised of energy and O&M cost savings. Additionally, the initial capital expenditure is significantly reduced due to component size reduction. A capital cost saving of $61,283 is anticipated.

SUMMARY

The test results show that the KCH ACTSEC technology, when placed on a tank system with ventilation and heating requirements, results in a smaller load demand for power and a reduced need for ventilation to meet ACGIH standards. Consequently, a smaller scrubber, scrubber pump motor, and induced draft fan are needed when the KCH ACTSEC technology is used. This translates into not only a reduced power demand, but also a lower equipment cost. The cost of the power consumed by the lid motors is small compared to the overall savings when the lids are used. Furthermore, the reduction in energy used by a facility using the KCH ACTSEC technology results in a corresponding reduction in atmospheric pollutant emissions from any fossil fuel power plant supplying the energy.

Original Signed By:
E. Timothy Oppelt
E. Timothy Oppelt
Director
National Risk Management Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency

Original Signed By:
Donn W. Brown
Donn W. Brown
Manager
CTC ETV P2 Metal Finishing Technologies Program
Concurrent Technologies Corporation

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