Some of the most dangerous and potentially lethal occupations involve working in tanks, manholes, and underground vaults. Federal, state, and corporate safety departments have written reams of documents and procedures on how to safely enter a confined space and perform some sort of maintenance, repair or cleaning operation. Good corporate work practices and procedures have existed for years at the industry-specific level. The phone, chemical, pharmaceutical, and storage companies and refineries have long seen the necessity of a "how-to" manual for work on their own specific confined space hazards.

The current OSHA standard, 1910.146, Permit-Required Confined Spaces, goes a long way in providing general industry with the framework for entering and exiting a confined space and identify some of the hazards a worker may encounter. This OSHA standard was the outgrowth of many existing standards that came together to provide a minimum for general industry to follow. The one process needed in the OSHA standard is a specific work practice on the safe removal of static electricity during confined space ventilation.

Meeting Industry Demands

As a manufacturer, we have to be responsive to the wants and needs of our customers. Since the development and marketing of the first Saddle Vent confined space entry ventilation system in the early 1990s, we have constantly been asked by companies, contractors, military and consultants, "How do you properly handle the potential problem of static electricity build-up when you are ventilating a tank or manhole?"

The art and science of ventilation has many books and articles to help in the quest for understanding the different techniques of ventilation used in industry. However, the one area that is very sketchy involves ventilation and the potential disastrous problems of electrostatic charges. Many of the corporate and government procedures reference that static charges should be removed, but few tell the worker how to do it. After reviewing a great many standards and procedures, it appears that the best source for understanding this
phase of the confined space ventilation procedure comes from an industry-spe-
cific source, ANSI/ASSP Standards 1501 and 2546, published by the American Pe-
troleum Institute in Washington, D.C. These two documents provide require-
ments and actual procedures for safe en-
try and work in tanks. More specifically, they address the issues with regard to
controlling static electricity. The one ingre-
dient missing in these standards is how to set up and test a good ventilation
system.

Static Electricity: The Basics

At some time in our lives, we have all
felt the effect of static electricity build-
up. By simply walking across the living
room carpet and touching a metal doorkn
ob or refrigerator, we can feel and see
the spark of discharged static electric-
y. I recently was filling my
car with gasoline and noticed a
inging notice on the gas
pump. The manufacturer of the
gas pump very plainly and
simply explained that if I got
out of my car to put fuel in the
tank, I should not get back in the
car with fuel pumping un-
til I touch the front frame of the
car and discharge any po-
tential buildup of static elec-
tricity or a resulting explo-
SION could occur. This really
cought my attention and illus-
trated the need for more spe-
cific treatment of the problem of
static electricity in ventila-
tion.

Free electrons will be at-
tracted to any other elec-
trically deficient nucleus. Movement of elec-
trons from one atom to another constitutes what is referred to as electro-
cal energy, including static electricity. What causes these electrons and static
charges to migrate from one atom to an-
other? This movement of static charges is due to such factors as a small change in
temperature, atmospheric pressure, relative humidity and the friction of air
through a piece of ducting. The energy
needed to cause this movement of atoms is very low. Even though all matter con-
tains free electrons, these electrons are
unable to move freely through materials
with high electrical resistance. These
materials are called dielectric.

Our basic Industrial Saddle Vent de-
vice is made of standard nonconductive
polyethylene and even if it is properly
grounded, the displaced electrons be-
come trapped on the surface of the de-
vice. When a substance of opposite po-
tality comes in contact with a nonconductive device, the trapped el-
trons can flow freely between the two mate-
rals. This sudden and rapid trans-
fer of electrons can cause a spark of suf-
ficient intensity to ignite a confined space
that contains flammable solvents, meth-
ane gas from decaying material, hy-
drocarbon residue, or fine airborne dust.
NOSH states that a low relative hu-
nidity, below 50 percent, can accelerate
the build-up of electrostatic charges.

Figure 3. This ventilation system made of conductive material forms a complete electrical circuit from the end of the duct all the
way back to the ground system blower.

Proper Ventilation System

Both OSHA, and API standards state
that good work practices in a confined
space require continuous ventilation
before and during the work performed in

a confined space. The objective of a good
ventilation system is to first remove gas
from the confined space and then to sta-
bitize the space by providing continuous
fresh air to work areas.

API recommends the use of a venturi-
type eductor air mover or an explosion-
proof electric blower. The electric motor
and on/off switches must be approved,
at a minimum, for use in Class I, Division
1, Group D atmospheres for methane and
Class II, Division 1, Groups E, F, and G for
dust hazards. Each blower selected must
have a metal ground lug located on the
blower. This lug is used to connect the
ducting and its wire helix to the
to a ground electrical bond (see Figure 1).

Upgraded 2003 Confined Space
Entry Technique

A good confined space entry program
includes meeting key objectives listed in
the OSHA 1910.146 and API standards:
one is the aspect of self-rescue. The use
of a device such as the Suddick Vent air
conduit (see Figure 2) allows the worker
to establish continuous ventilation in

www.occupationalhazards.com
Confinement space without obstructing the entry or egress of the workers. This device meets the objective of self-rescue for the worker who may encounter hazardous work environments.

The second key objective is to provide a ventilation system that eliminates the build-up of static electricity and provides for a safer work environment. The original Saddle Vest device is now available in conductive plastic material that conductive dusting and when properly assembled (see Figure 3) forms a complete electrical circuit from the end of the duct all the way back to the grounded ventilation blower. Electrostatic charges that traditionally would build up on the surface of the ventilation system can now be safely removed through the ventilation system.

Conclusion

Confined space entry is hazardous for even the most seasoned professionals. Unfortunately, most of the work done in confined spaces is done on an occasional basis with less than expert workers. It is only a matter of time when all the right conditions of fuel, oxygen and ignition come together to form another newspaper or magazine headline. We believe OSHA needs to seek the guidance and expertise of industry professionals to write additional "how-to" procedures to aid and assist the occasional confined space worker. The use of work-specific devices like the Conductive Saddle Vest System will eliminate one more potential hazard from the confined space worker's list of worries.

This article is only a beginning in an effort to bring to light the need for more help in the area of worker safety with regard to confined space entry. Industry professionals from many disciplines must work together to develop safe working procedures for general industry with regard to controlling static electricity in the work environment.

A detailed step-by-step method must be developed to set-up and properly test the conductive ventilation system. The use of a voltmeter meter can be invaluable to the supervisor setting up the system and answering questions such as what is the recommended maximum level of resistance (ohms) that needs to be achieved in order to remove the static charges.

David F. Angelico, B.S., M.B.A., is president of Air Systems International Inc. incorporated in 1986. First products developed consisted of small portable breathing air compressors designed with a unique fully automatic reverse air system, used in the nuclear industry. He developed the patented Saddle Vest air conduit used to provide continuous fresh air in confined spaces without having to remove the ventilation during. He testified and provided recommendations at the federal OSHA hearings on the confined space entry standard.

The Power Pusher reduces strains, pains, and pulls by providing ergonomic solutions that are tailored to your company's needs. It's compact size gives you flexible handling in tight spaces, while it's custom-crafted attachments allow you to move just about anything that rolls! For more information or a free demonstration call 1-800-800-9274.

CIRCLE 54 on reader service card or go to www.ohsinfo.com