



“A Breath of Fresh Air”

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In recent years, nearly everyone has become more conscious of the quality of the environment in which we live. With new environmental regulations, such as the European **RoHS** (**R**estriction of **H**azardous **S**ubstances) and **REACH** (**R**esearch, **E**valuation, **A**uthorization of **C**hemicals) in the headlines, it is difficult not to notice that everyone is searching for a safer environment in which to work and play. Additionally, more and more countries (China, South Korea and Norway, for example) and even some states in the U.S., such as California, are administering or are considering legislation that requires that the processes, as well as the products being manufactured, meet a higher standard of environmental safety.

It is extremely important in today’s world that the products people come into contact with at home and in the workplace become safer than the products of previous years. In 2007, there was a great public outcry when it was discovered that many products our families were in contact with daily, including many popular children’s toys, were being produced with lead paint. It is this type of situation that highlights the need for tighter controls in general for our society.

The same holds true for the type of environment that most workers spend the majority of their time in. Manufacturing companies worldwide spend hundreds of millions of dollars each year on health care. Safety in the workplace is critical in order to maintain a healthy workforce, especially when safety, or the lack of it, is not visible to the human eye. The quality of the air we breathe is one thing that is not only difficult to see and measure, but even more difficult for governmental authorities to regulate.

Manufacturing processes of all types can produce harmful substances that the average worker is subjected to on a daily basis. Virtually any material that is being changed or altered can release harmful substances into the airstream. For many years, common cigarette smoke was not considered harmful in most environments, especially the workplace, but today smoking is banned in many private and public areas because of the discovery of the negative health effects of secondhand smoke.

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Common conditions that are caused by direct contact, continuous breathing or inhalation of harmful chemicals would include:

- Allergic Reactions:
 - Lacrymation² (runny eyes) - Acute irritation of the eyes caused by high exposure to fumes.
 - Rhinorrhoea² (runny nose) - Acute irritation of the nose caused by high exposure to fumes.
 - Colophony^{1 2} - A contact allergy caused by contact with coniferous tree rosins / resins acids.
- Occupational Asthma² (respiratory disease associated with the workplace)
- Bronchitis (Acute Bronchitis caused typically by virus or bacteria and Chronic Bronchitis caused by tobacco smoke or infectious agents)
- Physical irritations (such as reactions to isocyanate solvents, dyes, fiberglass, etc.)

There is typically a latent period between the first exposure and the onset of symptoms of Occupational Asthma (OA). Under certain severe conditions, less than several months of exposure to a sensitizing agent may be long enough for the appearance of OA symptoms to occur. It can also take as long as twenty years for the symptoms to occur. However, the average time for the OA symptoms to be recognized is approximately four years².

This may in part be contributed to whether the exposure is over a long period of time with low levels of exposure to the sensitizing agent or to a single exposure at very high concentrations. Some of the chemicals, materials or processes that may cause concern for workers and their employers include the following²:

- Soldering fluxes used in hand soldering (including rosin / resin based fluxes)
- Solder paste / fluxes in semi-automated processes
 - V.O.C. (volatile organic compounds) in solder compositions
 - Halides
- Greases, oils and other lubricants
- Corrosion inhibitors
- Printing inks
- Solvents
- Cutting fluids
- Abietic acids
- Abietic / Abietyl / Methyl Abietate Alcohols
- Certain brands of pipe joint compounds
- Hydrochloric and primaric acids
- Carbon monoxide
- Machining, de-burring, cutting, polishing or grinding of metals

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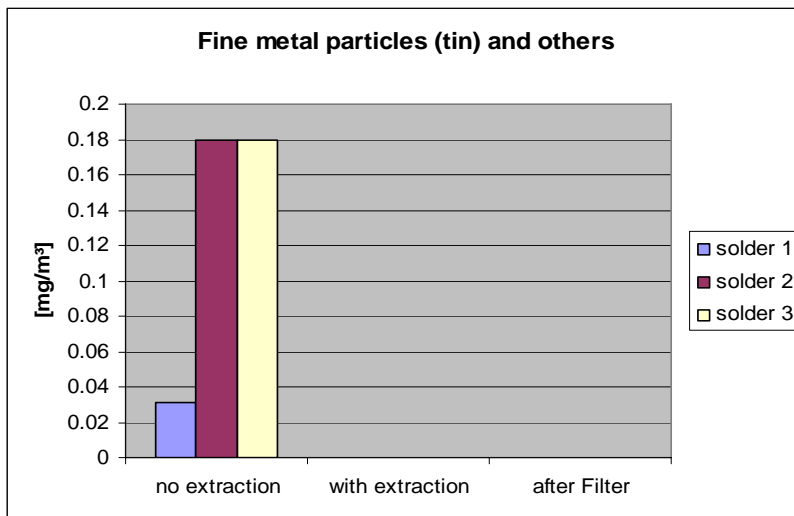
In electronics, as well as in general manufacturing processes, many different types of harmful chemicals or materials can be introduced back into the atmosphere. The safest and most efficient means of dealing with hazardous substances is to provide proper fume extraction equipment for purifying air in the workplace.

For the environment to be properly controlled, more than just a means of moving the air away from the workers is required. The best method is to provide a source for cleansing the air through efficient filtration. HEPA (High Efficiency Particulate Air) filtration is one means of controlling the air that is recycled back into the workplace. HEPA filtration provides air quality levels in the 99.5 to 99.975 % range (removing pollens, smoke, gases and even irritating odors) and making the purified air perhaps cleaner than it was originally when incorporating Active Carbon as part of the filtration.

Soldering applications can present the biggest challenges for companies who are contemplating the conversion to fume extraction. Many manufacturers believe that converting to “Lead Free” applications negates the need to provide fume extraction to the workplace, when in reality, the opposite actually holds true.

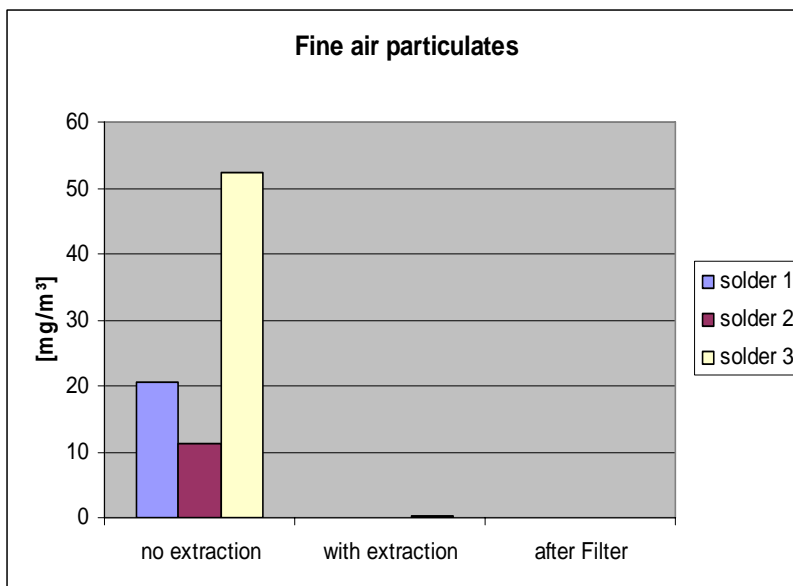
Weller has run tests using different flux-cored solder alloys for several years. A common procedure was the soldering iron tip life test that provided data on the quality and longevity of the iron plating of Weller soldering tips. Weller fume extraction equipment was employed to protect the working environment during these tests, and the Fine Metal Particles and Fine Air Particulates collected as by-products have offered a great deal of important data.

Weller teamed with several European test agencies to monitor the types and levels of solder contaminants found during the collection process. The following charts indicate the toxins and carcinogens extracted during these tests.



Maximum Allowable Threshold value for Fine Metal Particulates is 2 mg/m³ (per European Standards Assoc.)

What was determined by the collection of the contaminants is that the distribution of Fine Metal Particles into the air during hand soldering is virtually non-existent. The European Standards Association has established a Maximum Allowable Threshold of Fine Metal Particles of 2 milligrams per cubic meter (2 mg/m³). Of three different solder alloys tested during the initial phase of the experiment, only two came even remotely close to 1/10 of the Maximum Allowable concentration for Fine Metal Particles. This indicates that Fine Metal Particles are not generally re-distributed into the environment. When using fume extraction equipment that incorporates HEPA Filtration, the before and after results were reduced even further. Applications that involve metal working may however provide significantly differing results.



**Maximum Allowable
Threshold for Fine Air
Particulates is
exceeded without
fume extraction (per
Europeans
Standards Assoc.)**

The most interesting conclusion from the solder alloy testing is that the distribution of Fine Air Particulates into the environment during hand soldering exceeds the Maximum Allowable Threshold established by the European Standards Association. A limit was set for Fine Air Particulates to not exceed 3 milligrams per cubic meter (3 mg/m³). Of the three different solder alloys tested, all exceeded the Maximum Allowable Threshold. This indicates that Fine Air Particulates are re-distributed into the environment and should be a concern for workers in hand soldering applications. However, when using fume extraction equipment, the measureable levels were considerably reduced and after HEPA filtration, the levels were virtually non-existent.

The most significant point to be derived from this data is that it is extremely important to review the selected solder manufacturer's Technical Data Sheet and the Material Safety Data Sheets to define which solder/flux combinations either recommend or require the use of Fume Extraction.

Solder manufacturers' Technical Data Sheets will provide detailed information regarding safety and health concerns when using their products. The manufacturer may indicate one or more of the following recommended levels of ventilation:

- “Use in a **well ventilated** area”.
- “Soldering processes will generate product fumes, which **should be** vented”.
- “Soldering fumes **must be** exhausted or vented for operator safety”.

Additionally, all chemical manufacturer's application notes, process notes or Material Safety Data Sheets will be the primary indicator of whether normal ventilation is adequate or whether Fume Extraction should be applied in the workplace.

****Note: Before using external ventilation type systems, consult your local Fire Department (i.e. collection of flammable materials inside piping systems) and your local Environmental Agency (i.e. emissions regulations).**

*****Also consult your insurance carrier for information pertaining to openings in the walls or ceilings of a facility.**

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For more on Cooper Tools – Professional Tools and Weller® Fume Extraction products, visit: www.cooperhandtools.com

References:

T.R.U.E Test (www.truetest.com) – (1) Colophony

Filtronic AB (www.filtronic.se) – (2) Occupational Asthma White Paper

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