

“A Breath of Fresh Air”

January 28, 2008

The environment, in which we live, has become more quality conscious as each day passes. 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 safe society” to work and play in.

Additionally, more and more countries (China, South Korea, Norway and even North American states, such as California), are administering or considering similar types of legislations that require that the processes as well as the products being manufactured, meet a higher standard of environmental safety.

It is extremely urgent in today’s world that the products that our workers and our families come into contact with become safer than the products of previous years. In 2007, there was widespread acknowledgement of simple products such as toys being produced with high percentages of Lead in the paints that our families were dealing with on a daily basis. It is this type of public concern that generates the needs 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 paramount to maintain a healthy workforce, even when safety comes in forms that are not visible to the human eye. The air that we breathe is one area that is not only difficult to measure, but even more so to dictate.

Manufacturing Processes of all types can possibly 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 even the use of cigarettes has been changed by corporate policies and government legislations to ban second hand smoke.

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

- Allergic Reactions (such as Rhinitis¹ caused by airborne allergens or Colophony² caused by contact with coniferous tree Rosins)
- Occupational Asthma³ (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 chemicals, dyes, fiberglass, etc.)

Under certain conditions, less than five years of exposure to an occupational agent can be long enough for the appearance of OA symptoms to occur. This may in part, be contributed to whether the exposure is over a long period of time with low levels of exposure to the allergic agent or to a single exposure at very high concentrations. Allergic reactions may occur almost immediately or over an interval, depending on the concentration of the allergic agent that the body comes into contact with.

Some of the chemicals, materials or processes that may cause concern for workers and their employers include the following:

- Soldering Fluxes in Hand Soldering (including Rosin / Resin Based Fluxes)
- Solder Paste / Fluxes in Semi-Automated Processes
- Greases, Oils and other Lubricants
- Corrosion Inhibitors
- Printing Inks
- Cutting Fluids
- Abietic Acids
- Abietic / Abietyl / Methyl Abietate Alcohols
- Certain brands of Pipe Joint Compounds
- Hydrochloric and Phosphoric Acids
- Carbon Monoxide
- V.O.C. (Volatile Organic Compounds)
- Halides
- Machining, De-burring, Cutting, Polishing or Grinding of Metals

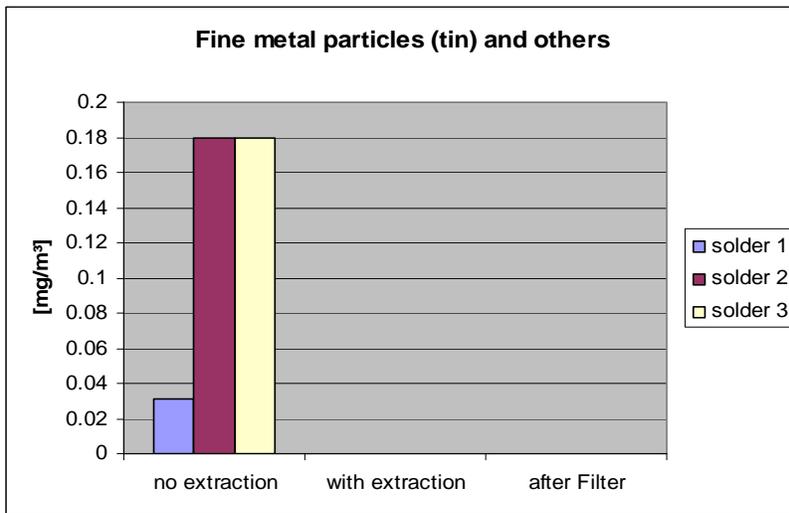
In electronics as well as general manufacturing processes, many different types of harmful chemicals or materials can be introduced back into the atmosphere. The safest and most efficient means of dealing with hazardous substances is to provide the proper means of purifying the air back to a safe air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

For the air quality to be controlled properly there is more to this than just a means of moving the air away from the workers. 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 what is recycled back into the environment. HEPA filtration provides air quality levels in the 99.5 to 99.95 % range, making the air that is purified, perhaps cleaner than its original state (removing pollens, smoke, gases, etc.) and even irritating odors when incorporating Active Carbon as part of the filtration.

Soldering applications can present the most challenges for companies who are contemplating the conversion to Fume Extraction. Most customers are of the belief that converting to “Lead Free” applications prevents the need to provide Fume Extraction to the workplace, when in reality, the opposite actually holds true.

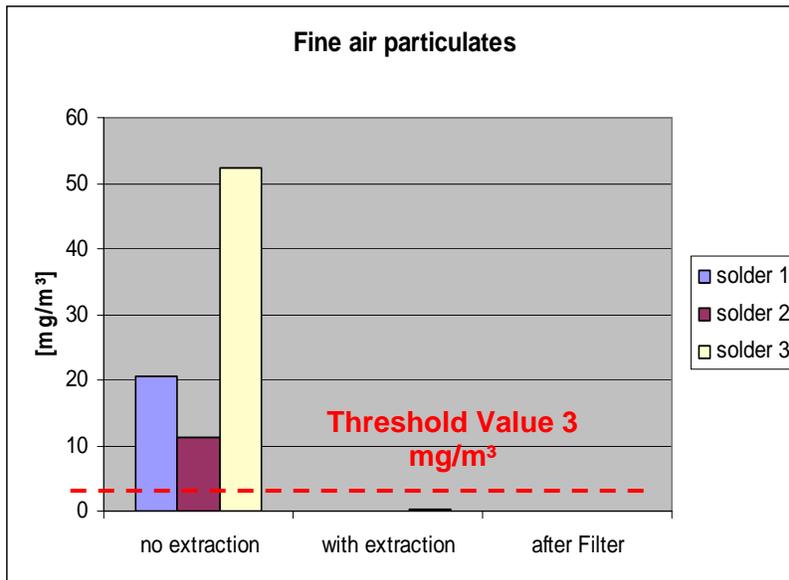
Weller has devoted several years of testing to different Flux Cored Solders alloys. This was typically in the form of Soldering Iron Tip Life test that provided data on the quality and longevity of the Iron plating of Weller soldering tips. As a byproduct of the tip life test, Weller Fume Extraction equipment was employed to protect the working environment during the test. The collection of Fine Metal Particles as well as Fine Air Particulates, has 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 that the toxins and carcinogens extracted during these test, are what has proven to be most interesting.



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

What was uniquely determined by the test is that the distribution of Fine Metal Particles into the air during hand soldering, was virtually non-existent. The European Standards Association set a Maximum Allowable Threshold of Fine Metal Particles at 2 Milligrams per Cubic Meter (2 mg / m³). Of the three different Solder alloys tested during this phase of the experiment, only two of the three came even remotely close to 1/10 of the Maximum Allowable concentration of Fine Metal Particles. This indicates that Fine Metal Particles are not generally re-distributed into the environment. Applications involving metal working may however provide significantly differing results. With Fume Extraction equipment used that incorporates HEPA Filtration, the before and after results were lowered even further.



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

The most interesting conclusion from the test is that the distribution of Fine Air Particulates into the air during hand soldering exceeded the Maximum Allowable Threshold. The European Standards Association set a Maximum Allowable Threshold of Fine Air Particulates at 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 measurable levels were considerably reduced and after HEPA Filtration, the levels were virtually non-existent.

The most significant point derived from this data is to be sure and review the manufacturer's Technical Data Sheet and the Material Safety Data Sheets to define which Solder / Flux combinations require or recommend the use of Fume Extraction.

Most all solder manufacturers' Technical Data Sheets will provide detailed information as to the Safety and Health concerns when using their products. The recommendations may indicate one or more level of ventilation, which may include one or more of the following recommendations:

- "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".

One or more of these cautions or process notes will be the primary indicator of whether normal ventilation or Fume Extraction should be applied.

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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References:

- Wikipedia – (1) Rhinitis
- Wikipedia – (2) Colophony
- Wikipedia – (3) Occupational Asthma