

Case Study

Solder dross recycling: Tried, tested and proven at Kimball Electronics

The world price of solder is at an all time high, so reducing solder consumption—and therefore costs—should be at the top of every electronics manufacturer's wish list. On average companies throw away 75% of their solder as dross, but by automating the solder dross recovery from their wave soldering process, a company can actually reduce de-drossing time by up to 80% and solder purchases by up to 50%. Here we look at how one company worked with their equipment supplier to automate this process in-house.

'Recycle, reduce, re-use' is set to become as much an industry mantra as 'smaller, faster, cheaper' as issues such as energy and resource consumption and waste management are increasingly pushed to the fore. One company already embracing these issues is contract manufacturer Kimball Electronics, who found that the upside of dross management is considerable cost savings.

Delve into the history of Kimball Electronics and you'll find a company born from resilience, with an intelligent response to market trends and an adept capability to make each business opportunity a success. The company began as The Jasper Corporation in 1950, based in Jasper, USA, and in 1959 acquired W.W. Kimball Piano Co. The electronics sector of the business began in 1961 with the production of electronics for its organ business. In 1963 was awarded its own identity as Kimball Electronics.

In 1983 Kimball Electronics gained a major contract to build keyboards for personal computers, and in the subsequent ten years shipped over nineteen million units. In 1992 they began producing computer mice, manufacturing over fifty million before the business was taken offshore. The last Kimball organ was built in 1985, the same year the company began producing products for the automotive industry, with their first anti-lock brake system. They produced their fifty-millionth such system for the same customer in 2004. The rest, as they say, is

history, and today Kimball Electronics is a major international supplier of contract manufactured electronic components.

The industry has seen many changes since 1961, and today, as the world is forced to look at its impact on the planet, manufacturing has had spotlight cast on its energy output, resource consumption and waste management. Marla Wineinger, responsible for Kimball Electronics' wave solder machines, played her part in looking at the impact of their business. "As a company we had a high consumption of solder bars, and I felt sure there must be a way we could reduce this. Of course as a company it is our responsibility to look at reducing costs wherever possible, but as an industry we must all look at reducing the world's resources we use, too."

At the time, Kimball Electronics was putting the dross from their wave soldering machines into 55-gallon drums and selling it to outside sources for recycling. "I wanted to look into whether it would be possible to deal with the solder dross more efficiently, to ultimately reduce our usage, but also to see whether this could be achieved by bringing the recycling process in-house," Marla says. "That said, the challenge would also be to find a solution that would be very simple, so that it did not impact heavily on our day-to-day production cycle. After conducting some research I became aware of the British-based company EVS International, a manufacturer of solder dross recovery with hundreds of systems in use worldwide."

Kimball Electronics enlisted the aid of EVS International director Simon Norman and his team, who worked in conjunction with Marla to look at their production and wave soldering processes. "It soon became clear that Marla was correct in her assumption—there was indeed a much more effective solution for their needs," Simon says. "With the high price of solder, a company can benefit enormously from recovering pure solder from their solder dross. Companies who incorporate our equipment into their production process, for instance, can expect up to an 80% reduction in de-drossing time and up to a 50% reduction in solder purchases, so with the rising cost of solder, the return on investment is seen in months—not years."

There are added benefits to recovering pure solder from solder dross with an EVS system, such as improvements in both process and line productivity. With a cleaner wave pot, manufacturers experience a significant reduction in shorts and bridging on the board, as well as reduced wave maintenance. The system provides a consistent wave height and improved solder quality, due to reduced oxidation, and users have the potential to dramatically reduce their consumption of nitrogen. Also, there are environmental standards to consider, such as ISO14001, which is fast becoming mandatory in our industry. Gaining or retaining accreditation is significantly helped by recycling dross at the point of manufacture.

Following further research into Kimball

Electronics' manufacturing process, EVS was also able to assure Marla Wineinger that bringing the process in-house, with an automated process, would have very little impact on their day-to-day routine and workload. The operator would be able to de-dross the wave, then carry on and prepare the wave for production while the equipment was performing its de-drossing cycle. Working in conjunction with Marla, Simon and his team determined that the most efficient system to match Kimball's needs was the EVS6000 solder dross recovery machine, which, coupled with EVS International's service and support, would ease the transition of bringing this element of their process in-house.

EVS International systems can recover pure solder from both lead-based and lead-free solder dross. The EVS6000 system is capable of handling up to 20kg/44lbs, with the capacity for single operation de-drossing of even the largest wave soldering machine. A large integrated hopper makes rapid transfer of dross both simpler and safer. Simon and his team determined that the EVS6000 would speed up Kimball Electronics' de-drossing by up to 50%. Using an enclosed automated system, hot dross is loaded into a large hopper and sealed into the machine. Once started by the operator, the process recovers the solder into a solder tray in the form of ingots that are easily placed back into the solder pots; it then deposits the spent dross automatically through a chute to a covered dross bin. After the start button has been pushed, the operator does not need to have any further intervention until the solder ingots are removed, a cycle that takes six

minutes plus cooling time. Because the process is self-contained it avoids excessive handling of heavy lead-contaminated dross and can operate with its own filtration system to filter out smells and noxious fumes. A hopper extraction system prevents the escape of any fumes and dust that may be generated while loading. It also uses no chemicals, radiation, additives or other noxious substances.

Air is extracted via a powerful stand-alone, four-part filtration system, which ensures that the air emitted is cleaner than the surrounding workplace. An automatic air-knife cools the molten solder ingots until safe to handle, with premature removal of the ingot tray prevented by a safety lock.

Safety in the workplace is of course paramount, not only for the operating procedure but also for the routine maintenance and cleaning functions. Because of the nature of the process, extensive safety features have been built into the EVS6000 to protect against misuse.

Maintenance is assisted by prompts from an LCD read-out and facilitated by easy access to all working parts of the machine. Routine cleaning can be carried out from a comfortable standing position.

In the last three years, Kimball Electronics has introduced three systems at their plant in Jasper and two in Reynosa, Mexico. "As explained, ease of use was of prime importance to us," Marla says. "I didn't want it to impact heavily on our existing workload. Since the equipment can be used with just one existing operator, even though we have added another process to our day we required no additional labor. It

really was as simple as plug in and go—with minimal training required.

"We can now recover waste material from our wave solder process and return it to usable product on site at the point of manufacture, so we have certainly achieved what we set out to by bringing this process in house. However, there have been many unexpected benefits too, on top of reducing the material going into the waste stream. We have been able to reduce machine set up time and machine downtime. We have reduced our administration and improved the working area, with no noxious fumes and a cleaner workshop floor and, of course, we have reduced our solder bar usage—which in turn has provided considerable cost savings. All in all this has been a real success story for us. It represents the largest payback of any product we have purchased." Kimball Electronics is now beta-testing the latest EVS system, the EVS1000.

"Kimball Electronics is a very forward-thinking company," says Simon, "and it has been very rewarding to see the benefits they have been able to gain since the start of this project. 2007 has been an excellent year for us, culminating in our latest EVS1000 system winning 'Best Product – Europe' at the recent Global SMT & Packaging Technology Awards."

One of the major contributing factors to EVS International's success has been the high cost of solder and the widening adoption of lead-free solder, at a 200 to 300% premium over lead solder. The electronics industry is now switching on to the benefits of ISO14001, with more and more companies actively pursuing what EVS call 'Efficiency, Effectiveness and Cost Reduction.'



Graham Norman, managing director of EVS International, with an EVS6000 solder recovery system.



Kimball Electronics' Marla Wineinger sought a more efficient way of dealing with solder dross.