

Application for a Small Grant from the Sustainable CU Environmental Improvement Initiative

Title: Initial Steps to Reduce the Large Waste Stream of Laboratory-Specific Materials on CU Boulder's Campus

Applicant:

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Description of Project:

There is a large waste stream of materials coming out of the scientific laboratories on the CU-Boulder Campus. A minor portion of these materials can be recycled through the current recycling system on campus (such as scientific catalogs, paperboard boxes, and cardboard boxes), but the vast majority of materials cannot be included due to the following reasons: a) CU-Boulder does not currently offer recycling for that type of material and b) special attention is required to ensure safety since laboratories often use hazardous materials. As a scientist who worked in CU-Boulder's labs for more than 10 years, I can honestly tell you that there are many opportunities that exist to significantly reduce this waste stream and quite a few will not be that difficult to implement.

As a first place to start to reduce this large waste stream coming from CU-Boulder's labs, LWEEP, in collaboration with CU Recycling, CU Environmental Operations, CU Environmental Health and Safety, and Eco-Cycle/CHaRM, is addressing two initial categories of materials which the labs are generating in large quantities and which are very clean and thus do NOT pose any hazard to those handling the materials:

1) **Styrofoam Shipping Boxes:**

Problem: In the biological sciences, many materials purchased from manufacturers (such as enzymes, nucleotides, antibodies, and cells) need to be shipped on ice or dry ice. As a result, labs in Biochemistry, MCDB, Psychology, IPhy, Institute for Behavioral Genetics, and Ebio have a large influx of Styrofoam shipping boxes (mostly approximately 1-3 cubic foot in size). The labs do what they can to reuse these boxes and efforts have been made by LWEEP to try to find others who could use these boxes by advertising them in the City of Boulder's PACE program. However, no has stepped up to say that they can use these Styrofoam boxes despite the fact that they are very clean.

Estimated Quantity: If we assume ~20 Styrofoam boxes per workday arrive to campus labs x 250 days per year (the labs are open year around), the total comes to approximately 5000 boxes per year.

Solution: Start a pilot for recycling Styrofoam with MCDB, the laboratory department which is the largest generator of this material, and expand the program to include other laboratory departments based upon the success of the pilot. Eco-cycle's CHaRM truck would come to campus once every two months to pick up the Styrofoam from a "one-day only" collection site. Between collection days, labs would store the Styrofoam in their laboratories.

Feasibility: After significant work and a number of meetings, the logistics of setting up this pilot are almost complete. All necessary parties (LWEEP, MCDB, CU Recycling, CU Environmental Operations, Campus Fire Marshall, and Eco-Cycle/CHaRM) have been included in the planning of the



pilot and are supportive of this pilot moving forward. The MCDB Department has even committed \$1000 to help pay for a one year pilot program.

2) Pipette Tip Boxes and Wafers



Problem: Primarily in the biological sciences, there is extensive use of pre-stacked small pipette tips (1 microliter to 1 milliliter in size). Associated with these pipette tips are #5 plastic boxes and wafers that hold the tips. In the majority of cases, when the tips within a box have all been used, the wafer which held the tips within the box is discarded and a new wafer of tips is put into the same box. However, in some cases, due to the highly sensitive nature of experiments, the lab requires a newly sealed box of tips every time and the old box (with wafer) is discarded. The extensive use of these pipette tips results in the generation of a large quantity of very clean #5 (PP) plastic waste (as shown in the picture to the left). One manufacturer of these products has been coming around and picking up wafers to be recycled and the offer of recycling has been very successful in getting many labs to switch to this company's products. However, follow-up has determined that these wafers are most likely being burned for energy.

Estimated Quantity: 15,000-30,000 wafers/year and 5,000-10,000 boxes/year

Solution: A two-fold solution will be implemented for this material type:

- a) Work to reduce the generation of this type of material by promoting:
 - i) Self-stacking of tips rather than buying pre-stacked tips through educational posters which will demonstrate cost savings to the labs
 - ii) The use of pre-stacked tips with more Eco-friendly packaging (see picture to right) such as this new product where the box and wafer are made of 100% paperboard rather than a #5 plastic. Because of the very clean nature of pipette tip boxes and wafers, this paperboard product can simply be placed in the current recycling offered on campus. LWEEP will get Chemistry Stores and MCDB Stores (the two places on campus which carry laboratory supplies) to start carrying these more environmentally friendly tips and also provide laboratories with free samples to test out.
- b) Secondly, offer recycling of the #5 pipet tip boxes and wafers through a new program by CHaRM which is currently being developed and will likely be available early next year. In this case, the plastic would actually be recycled for use in other products, rather than burned for energy. CHaRM has worked to develop this program because this material is also heavily generated by numerous scientific industries in the area such as Amgen. The CHaRM truck coming to campus for Styrofoam collection would be utilized to pick up this material at the same time.



Feasibility: Harvard University and the Center for Disease Control (CDC) with the federal government already have successful programs in place for recycling plastic pipette tip boxes/wafers and Eco-cycle reports that it should not be too much longer before they have their program in place. Furthermore, this is a much denser material than Styrofoam and thus, while space was one of the biggest hurdles for designing the Styrofoam pilot described above, the pipette tip boxes and wafer would require a much smaller collection area.

In regards to the use of the pipette tips in paperboard boxes, some labs which run experiments sensitive to RNases and DNases may not be able to use this product, but for most purposes it will be just as effective as the other products. One drawback is the higher cost of these pipette tips verses ones in plastic boxes. However, in the past, labs have been willing to purchase more environmentally friendly paper for their printers despite the higher price and I suspect that the desire of the labs to reduce their impact on the environment will push many of them towards this product as well. Plus, in the near future, LWEEP is planning on working to address the cost of disposing the abundance of single use plastics leaving the labs by perhaps tacking a

disposal fee on to these products which would make more environmentally friendly alternatives more cost effective.

Student Involvement: Students will be highly involved in this project since 1) undergraduate students working with LWEPP will be involved with the educational campaigns (poster creation and poster hanging) and 2) the majority of individuals working in campus laboratories are graduate students. In fact, it is the graduate students (and post-doctorates) in the labs that are fervently requesting the ability to recycle lab materials. Some lab members are so passionate about trying to do something to reduce this constant flow of material into the trash from the labs, that they personally drive Styrofoam to CHaRM with their own vehicles and pay the recycling fee with their own money. I know of three individuals in three separate labs that have been doing this for quite some time.

Impact goes far beyond recycling: There is a much larger impact to this project that simply reducing Styrofoam and pipette tip box/wafer waste. The labs have wanted and have been requesting the ability to recycle products that they know to be non-hazardous for a long time. Providing them with this opportunity to begin to recycle some basic materials gives them hope that, with time, they will be able to conduct their research without having such a negative effect on the environment. The Styrofoam and pipette boxes that pile up in the biological science labs are an incredible visual of waste. While LWEPP is working with these labs to reduce their energy and water usage with success, at times it can be hard to compete with these visual waste piles accumulating in their lab that the lab members long to address. Providing the labs the opportunity to recycle lab-specific materials will only benefit their interest in conservation as a whole (including energy and water) and increase their participation, excitement, and interest in LWEPP. I hope that the Environmental Center Board will consider funding this proposal not only because of the reduction of waste, but because of contribution it makes towards promoting conservation as a whole in the minds of the scientific researchers, something that LWEPP is working hard to bring to CU-Boulder labs.

Budget: Request for \$2100 from Sustainable CU

\$700 to add to MCDB's contribution of \$1000 for a total of \$1700 for a year-long 2011 MCDB recycling pilot

The pilot would first start for only Styrofoam but pipette tip boxes/wafers would be added in the near future (once CHaRM's new program comes on-line and once pipette box/wafer recycling design is completed with CU Recycling and CU Environmental Operations). Since, according to CHaRM, it will not cost anything to recycle the pipette tip boxes/wafers and the CHaRM truck being used to pick-up the Styrofoam can also be used to pick up the pipette tip boxes/wafer, the calculation of cost for this pilot will solely rely on the Styrofoam costs:

If we assume that MCDB has 2000 Styrofoam boxes per year to recycle of an average size of 2 cubic feet and that it costs \$6 to recycle 13.5 boxes of this size (Eco-Cycle charges \$6 per cubic yard), that come to a total of \$890. Plus there is a \$75 dollar per hour charge to use the CHaRM truck. So if we assume a cost of \$75/pickup and six pick-ups per year, that comes to \$450. Plus there is a high accumulation of Styrofoam currently in the MCDB building which first needs to be purged. Thus I estimate this purge pick-up to cost \$360 (approximately twice what a regular pick-up would cost). Together this comes to: $\$890 + \$450 + \$360 = \1700

\$850 to expand the recycling pilot to other departments for latter half of 2011

Once any issues with the MCDB pilot are worked out, LWEPP, in collaboration with CU Recycling and CU Environmental Operations, will work to expand the program to include other departments also generating large quantities of Styrofoam boxes and pipette tip boxes/wafers. If we assume that we could capture an additional 1500 Styrofoam boxes (buildings will need to be purged again) during the latter six months of 2011, that would cost approximately \$650 and additional CHaRM truck time on the order of an additional \$200 (trips can be shared with the MCDB pilot but additional pickup points would mean additional time at the \$75/hour rate, plus the impact that building purges will cause).

\$550 to purchase e-dek boxes of pipette tips to provide as free samples to labs to test out

Scientists are very particular about changing the products they use because it adds another variable to their experiments. In order to get the labs to begin to try out these tips (in more environmentally friendly packaging), LWEPP will need to provide some free samples for them to test out at their convenience in the lab. At the <http://www.lightlabsusa.com> website, 50 e-dek boxes of 10 microliter pipette tips, 50 e-dek boxes of 200 microliter pipette tips, and 10 e-dek boxes of 1 milliliter pipette tips plus shipping comes to a total of \$549.09.

Other funding sources not mentioned above: Funding for signage and posters, and hours spent developing and promoting these projects will be funded primarily by the LWEEP budget with help also coming from CU Recycling and CU Environmental Operations.

Timeline: The MCDB recycling pilot will begin in December with Styrofoam. The inclusion of the pipette tip boxes and wafer recycling will likely occur at the end of the first quarter of 2011. An expansion of the recycling pilot to include other laboratory departments is expected to occur during the early summer of 2011.

Promotion of use of the e-dek tips (by passing out free samples for labs to try) will begin immediately as well as discussions with Chemistry Store and MCDB Stores to begin carrying these products for the labs.

Sustainability: Environmentally, this project benefits waste reduction at CU-Boulder but also sets an example for other research institutions to follow nationwide. The social equity leg of sustainability is also benefitted by waste reduction since most landfills are located within low-income communities.

While the initial start-up to this project is costly, I expect it to be economically sustainable within a short period of time for the following reasons:

- 1) It reduces waste going into dumpsters which will only become more costly as trash disposal prices increase. Furthermore, Styrofoam is particularly voluminous and thus takes up a lot of room in dumpsters.
- 2) Once started, the laboratory departments will not be willing to give up the recycling opportunities because the lab members will demand that they keep it. As I stated before, the lab members have been waiting a long time for this opportunity. MCDB's contribution of \$1000 towards a start-up of a Styrofoam pilot is testimony to their interest in having such a program. As a result, I expect that lab members will be responsible about the manner in which they recycle so they do not risk losing the opportunity and that departments will be willing to give money to keep programs going after start-up funds end.
- 3) As these recycling opportunities become campus-wide collections with many departments involved, the cost of individual department involvement will drop. Furthermore, lab Styrofoam recycling could also be combined with IT Styrofoam recycling which is obviously also needed as shown by this picture to the right taken by Dan Baril.
- 4) LWEEP will be working in collaboration with a network of other universities nationwide to push for manufacturer responsibility regarding laboratory materials, such as including a fee in the price of a material to take care of the item at the end of lifetime or requiring that manufacturers take back the materials themselves. For example, a couple of companies provide prepaid return labels on their Styrofoam boxes right now. However, the vast majority do not.



Innovation: Very few colleges, universities, or institutes nationwide have begun to address the large waste stream of materials coming from scientific labs. As a result, this project has great potential for being a model for others.