

# **Paper Towel Waste Reduction at Western**

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## Executive Summary

### Problem

Many bathrooms on Western's campus produce a large amount of paper towel waste that contributes to the overall carbon footprint of the university. Pilot projects aimed at reducing paper towel waste on campus such as the Haggard Hall composting initiative and the Arntzen Hall Dyson AirBlade pilot have provided the university with valuable information on which method of reducing waste and drying hands was most practical and preferred by students.

### Solution

We propose the removal of paper towel dispensers in bathrooms which will be replaced by energy efficient Mitsubishi Jet Towel hand dryers in bathrooms across campus. This will reduce paper towel consumption and outgoing paper towel waste on campus while simultaneously reducing Western's carbon footprint and save the university money on purchasing paper towels and reduced landfill disposal costs.

### Sustainability

This proposal would help to promote sustainability on Western's campus in a number of ways. First, by using the new hand dryers, students are minimizing wasteful consumption of paper towels. Next, it would significantly reduce the university's carbon footprint. Not only do the machines require very little electricity, but also eliminate carbon emissions from the production, transportation, and disposal of paper towels. Less paper towels also means less production of landfill waste on campus. Waste audit data shows that over 50% of Western's landfill waste consists of compostable items, with paper towels making up over 20% of this total waste. Finally, this proposal promotes financial sustainability for the school via huge cost savings from the purchase and removal of paper towels

## Funding Requirements

Installation costs (baseline estimates - may vary from building to building)

Wiring (if necessary) ~ \$1,000

Installation ~ \$300

Mitsubishi Jet Towel - \$1,300

Total: \$2,600 per machine

## Organization

Campus Sustainability Planning Studio - Western Washington University

## Statement of Need

According to waste audit data provided by the Air and Waste Management Association, 19.78% of Western Washington University's total waste by volume comes from the usage of paper towels. Previous pilot projects on Western's campus have taken aim at reducing the amount of paper towel waste that goes to the landfill with varying degrees of success.

Starting in December 2010, students from the Campus Sustainability Planning Studio class implemented a composting pilot project to reduce the amount of paper towel waste in the 1<sup>st</sup> and 2<sup>nd</sup> floor bathrooms in Haggard Hall, as well as educate bathroom users about composting through clear and effective education signage. The cost for the 6 month pilot project was \$1,400, which was mainly used for purchasing compostable trash bags and was funded by the Green Energy Fee program.

Starting in September 2011, another group of students from the Campus Sustainability Planning Studio class implemented a Dyson AirBlade high efficiency hand dryer pilot project in Arntzen Hall Concourse bathrooms, also with the goal of reducing paper towel waste. The total cost of the project included \$12,000 for equipment and installation,

and another \$1,000 for education and outreach. Four units were installed between the two bathrooms and paper towel dispensers were removed.

Two other types of high efficiency hand dryers were tested in Miller Hall after it had been remodeled as well. This building tested Veltia and Mitsubishi hand dryers to help determine which model to go with for future projects. Users were asked to send comments to the Office of Sustainability about which hand dryer they preferred most. The Mitsubishi JetTowel was the preferred machine between the three tested on campus, so that is the machine being proposed for this report.

After examining both the composting and energy efficient hand dryer pilot projects, we determined that this project should focus on the installation of hand dryers because they are the most cost-effective way to reduce the total landfill waste on campus. While composting reduces the amount of paper towel waste going to the landfill, there is still the cost of purchasing paper towels and compostable bags combined with the added labor costs from sorting and removal. Energy efficient hand dryers, on the other hand, eliminate the need for paper towels and trash bags altogether.

Furthermore, interviews with custodians revealed that composting programs on campus are difficult to run efficiently because students frequently throw compostable items in trash bins while non-compostable items end up in the compost and need to be sorted out, which Waste Management and custodians are not willing or required to do. This means that any compostable bag containing non-compostable items is simply diverted to the landfill.

## **Project Description**

### Methods

First, a bathroom inventory for most of the academic buildings on campus was completed to determine which buildings and bathrooms would be most suitable for

hand dryer replacement. Buildings that already had hand dryers installed (whether high efficiency or an older model) were not included in the inventory because replacing them would not be cost-efficient due to the need to rewire. Waste audit information from academic and residential buildings on campus, along with an analysis of various composting and hand dryer pilots helped to determine which buildings to focus on first.

The Miller Hall hand dryer pilot also provided us with valuable information on the model most preferred by students, staff, and faculty. Users were asked to send comments to the Office of Sustainability on how they liked the Mitsubishi and Veltia hand dryers that were installed. In all, the Arntzen Hall and Miller Hall hand dryer pilots installed three different kinds of hand dryers: the Mitsubishi Jet Towel, the Dyson AirBlade, and Veltia models. Surveys showed that the preferred model was the Mitsubishi JetTowel and is therefore the model featured in our proposal.

Next, implementation costs were estimated for purchase, installation, wiring, and maintenance. Estimates were made by building as well as by bathroom, and were formulated using the market price for the units and installation cost estimates from both the Mitsubishi website and Greg Hough with Facilities Management. The table to the right shows the amount it would cost and units needed to completely convert from paper towels to hand dryers

	# units to install	Cost
Environmental Studies	14	\$36,400
Arntzen Hall	8	\$20,800
ETEC	8	\$20,800
Fine Arts	4	\$10,400
Old Main	12	\$31,200
Humanities	8	\$20,800
Wilson Library	12	\$31,200
Haggard Hall	10	\$26,000
Bond Hall	8	\$20,800
Parks Hall	6	\$15,600

The table below shows the amount it costs in paper towels each month for a high, medium, and low use bathroom. Comparatively, drying your hands with the Mitsubishi Jet Towel would only cost \$0.18 if the machine is used at a rate of 1000 times per week versus \$15.00 per week in just paper towel costs alone for similar hand drying usage.

The cost savings from switching to energy efficient hand dryers puts the payback period of most machines between 3-6 years depending on the final costs for installation coupled with how often the machine gets used to offset paper towel use.

1 Hand dry	30" of Paper Towel			
1 800' Roll of Paper Towels	\$4.86			
Paper Towel cost/Hand dry	\$0.015			
<b>Bathroom capacity</b>	<b>Uses/Day</b>	<b>Cost/Day</b>	<b>Cost/Week</b>	<b>Cost/Month</b>
High use	300	\$4.50	\$22.50	\$90.00
Medium use	200	\$3.00	\$15.00	\$60.00
Low use	100	\$1.50	\$7.50	\$30.00

### Five Year Plan

The total price it would cost to convert each building from having paper towel dispensers in bathrooms to energy efficient hand dryers was calculated, and then buildings were paired together to balance out the amount it would cost each year to install in academic buildings across campus. The total price comes out to around \$50,000 per year for 5 years, and would cover most of the buildings on campus.

Buildings	Total Cost
Environmental Studies & Parks Hall	\$52,000
Wilson Library & ETEC	\$52,000
Haggard Hall & Old Main	\$52,000
Arntzen Hall & Humanities	\$52,000
Bond Hall & Fine Arts	\$41,600
Average cost/year	\$49,920

### Conclusion

Western has experimented with various forms of waste reduction with previous pilot projects. The intent of this follow-up project was to assess which is the more efficient program for future implementation. Composting, while a great initiative, failed to demonstrate cost-effective paper towel reduction on campus. High efficiency hand dryers, while expensive up-front, provide a much more sustainable solution to the wet hand dilemma, both in terms of cost and benefits to the environment. Therefore we propose a five year campus wide adoption of hand dryers to reduce paper towel waste and make Western a more sustainable university.

## Appendix A

Electricity costs calculations (1 Mitsubishi hand dryer based on 400 uses per day):

Current pricing per kWh is \$0.07

1 hand drying cycle is approx. 10 seconds

1 hand drying cycle uses approx. 0.66 kW of energy \* 10 seconds \* (1 min/ 60 sec) \* (1 hr/60 min) = 0.0027777 hrs/dry cycle

0.66 kW \* 0.0027777 hr = 0.0018332 kWh per use

(0.0018332 kWh/use) \* (400 uses/day) = 0.73328 kWh/day

(0.73328 kWh/day) \* (\$0.07/kWh) = \$0.051/day

Electricity cost projections (1 hand dryer @ 400 uses per day):

\$0.35/week @ 400 uses/day

\$0.27/week @ 300 uses/day (high use)

\$0.18/week @ 200 uses/day (medium use)

\$0.09/week @ 100 uses/day (low use)

\$1.50/month

\$18/year Example Building Analysis

### Example Building Analysis

The Environmental Studies building represents a building that could use a hand dryer upgrade.

- Ground Floor: These are high traffic bathrooms that currently produce a large portion of the building's paper towel waste. 2 Mitsubishi hand dryers would be needed per bathroom, for a total of 4 on the ground floor.
- 1st Floor and Above: These bathrooms are small, with only 2 sinks and 1 paper towel dispenser in them. Only 1 Mitsubishi hand dryer would be needed per bathroom, for a total of 10 installed on the upper floors, 2 per floor.
  - Total # Mitsubishi hand dryers needed: 14
  - Estimated total cost for ES Building: \$32-36,500