



Paper

The hotel industry – a shift to greener and lower cost operations

By the Malta Business Bureau's EU LIFE+ Investing in Water Project

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Abstract

At its start in 2011, the EU LIFE+ Investing in Water Project wished to focus on identifying a set of water saving solutions which would be transferable to hotels of different types and categories. In order to do so, water consuming applications common to a wide variety of hotels had to be identified. In the early stages of the project, toilets, showers and wash hand basins were the three main water consuming applications identified as being common to all hotels. It was assumed, based on rigorous experience by industry professionals, that in most cases these applications consume a large part of the hotel's total water consumption. Experience also dictated that water saving interventions on these applications could result in significant savings.

This paper is based on water audits carried out by the project in 42 hotels over the period February 2012 to September 2013, representing 30% of hotels in Malta. The paper statistically quantifies the consumption of these three applications, and explores the potential savings that may be achieved on an industry-level by implementing off-the-shelf solutions.

Introducing the main water saving solutions of interest in Malta

A) Interventions on showers, wash-hand basin taps and toilets

The project advocates flow rate and flushing volume control as a means of saving water on these applications. The following ideals have been identified:

Showers	– flow rate	– 7 litres per minute
Wash-hand basins	– flow rate	– 5 litres per minute
Toilets	– flushing volume	– 6 litres per flush

These rates have been identified based on best practice observed by the project in water efficient hotels, and after researching international water-savings benchmarks¹. However, it should be noted that as technology improves these ideal flow rates and flushing volumes will decrease. An excellent example is an ultra-efficient 4.5 litre flush volume toilet which has recently been placed on the local market, or showerheads reducing flow rates below 7 litres per minute without affecting the quality of service. Notwithstanding these ultra-efficient examples, the project decided that at this point in time, the above ideals would better serve the general industry - not because no better flow rate can be achieved, but because these flow rates can easily be achieved by retro-fitting sanitary hardware already in use by the hotels, which is not of the latest or most technological design.

B) Greywater Recycling

Apart from ensuring optimum flow rates and flushing volume, water recycling could play a significant role in reducing overall water consumption. Grey-water treatment takes waste water from showers and wash-hand basins, treats it, then re-uses it for flushing toilets with, or other 2nd class water applications. Such technology could eliminate all the toilet water consumption within a hotel; simply by recycling water from showers and wash-hand basins.

Findings – main water consumers

Data on water consumption and guest nights, as well as flow rate readings were obtained from 42 audited hotels, which represent 30% of all hotels nationally. This data was diligently evaluated for accuracy and reliability for each audited hotel, and then compiled and assessed collectively so as to obtain averages. These averages were then used to estimate water consumption for each hotel category on a national level.

The average flow rates/toilet flushing volumes per hotel category for the relevant applications were found to be:

	Wash Hand Basin Tap flow rate (in litres per minute)	Shower Tap flow rate (in litres per minute)	Toilet Flush Volume (litres)
5 star	10.85	9.80	8.57
4 star	11.47	11.17	7.69
3 star	10.17	8.30	8.19
Average	10.75	10.20	7.94
Recommended	5	7	6
Oversize factor	2.15	1.46	1.32

- At least 2 measurements were taken for each hotel, for each water consumption unit, usually from guest rooms in the highest and lowest floors. The results in the table above shows the average values obtained for all audited hotels, according to category.

From the above it can be seen that the as-measured tap and shower flow rates and toilet flushing volumes exceed the recommended benchmarks. The greatest deviation from the ideal was in the case of tap flow rates, where the measured flow rates were more than twice the recommended flow rates. While this situation illustrates poor water savings awareness, it indicates significant potential savings.

The measured values were collectively analysed to estimate the contribution of wash hand basin taps, showers and toilets to the hotel's total water consumption. The table below shows the aggregated results by hotel categoryⁱⁱ:

Hotel	Wash-hand basins	Showers	Toilets	% of total consumption
5 star	4.90%	27.72%	13.26%	45.88%
4 star	7.55%	44.76%	16.38%	68.69%
3 star	9.43%	45.06%	22.01%	76.50%
<u>Totals</u>	<u>7.23%</u>	<u>42.12%</u>	<u>16.75%</u>	<u>66.10%</u>

It can be seen that showers are the main consumers of water in hotels, irrespective of category; they account for 42% of total water consumed by hotels in Malta. The contribution of guest room water consumption to total consumption is 66% on average. The balance is made up of water used in kitchens, swimming pools, landscaping, and process water in plant rooms, floor washing, and public restrooms among others.

It is worth pointing out that the relative contribution of wash hand basin taps, showers and toilets to the overall water consumption increases for lower hotel categories, as expected. For 3 star hotels, this accounts for 77% of total consumption, dropping to 69% for 4 star hotels and dropping further to 46% for 5 star hotels. This is attributed to the fact that the amount of non-guest room water consuming facilities increase with hotel classification.

Potential Savings through interventions on taps, showers and toilets

By comparing the measured flow rates and toilet volumes with the recommended values, it was possible to calculate the potential water savings that may be accrued from making interventions on taps, showers and toilets.

These include the better regulation of water delivery pressure on taps and showers, or installing restrictors on taps and showers, or replacing shower heads with more water efficient ones or partially closing angle valves in the water supply to taps. In the case of toilets, interventions include reducing flushing volumes by installing water displacement devices in cisterns, or gadgets that allow the user to regulate the duration (and therefore volume) of the flush or by reducing the water level in the flushing cistern.

The estimated potential savings through these interventions are shown in the table below:

Hotels	Wash-hand basins	Showers	Toilets	% of current consumption
5 star	2.51%	9.00%	4.13%	15.65%
4 star	4.14%	14.28%	3.19%	21.61%
3 star	4.68%	5.70%	4.85%	15.23%
<u>Totals</u>	<u>3.73%</u>	<u>12.05%</u>	<u>3.69%</u>	<u>19.47%</u>

Water Savings from Greywater systems

The potential savings through greywater recycling can be estimated by assessing toilet water consumption, which represents toilet water demand. On average toilet water demand was calculated at being 16.75% of total consumption. To this one should add a 5% contingency to make good for invisible leaks in toilet bowls, and 10 – 15% additional annualized demand for landscaping, floor washing etc.

	Grey water recycling potential (minimum*)
5 star	18.26%
4 star	21.38%
3 star	27.01%
Totals	21.75%

- Estimated on the calculated toilet water demand plus 5% contingency for internal (and generally invisible) leaks. If the hotel also has a demand for 2nd class water other than toilets, then the greywater recycling potential increases accordingly.

For all hotel categories, shower water consumption exceeds toilet water consumption. This means that there should be no issues relating to a lack of greywater to treat. Rather, sizing of the greywater system should be focused on the demand for 2nd class water, taking seasonal fluctuations into consideration.

Compiling all water saving opportunities in a single table:

Hotels	Interventions on wash-hand basins	Interventions on showers	Interventions on toilets	Introducing greywater recycling potential	Total water savings expressed as a % of current consumption*
5 star	2.51%	9.00%	4.13%	18.26%	29.77%
4 star	4.14%	14.28%	3.19%	21.38%	39.80%
3 star	4.68%	5.70%	4.85%	27.01%	37.39%
<u>Totals</u>	<u>3.73%</u>	<u>12.05%</u>	<u>3.69%</u>	<u>21.75%</u>	<u>37.53%</u>

- Any water saving intervention on toilets will reduce the toilet water consumption and therefore the amount of water that may be recovered from a greywater system. To avoid double counting, the savings from interventions on toilets have been removed from the total savings.

Conclusions

It is clear that the industry wide adoption of two simple water saving solutions could lead to a drastically reduced water consumption by the hotel industry in Malta. Adopting water flow regulation of showers and wash-hand basins alone would lead to an industry-level reduction in water consumption of 15%, while including grey-water recycling would lead to an industry-level reduction in water consumption of 37%.

It is therefore highly recommended that hotels examine their flow rates to bring them in line with the recommended standards, and explore the possibility of harvesting, treating and re-using grey-water.

It is likely that in most cases, grey-water recycling will not be possible at this point in time. This is due to a plumbing infrastructure which does not permit the separate collection of grey from black water (i.e. waste water from showers and wash-hand basins separate to that from toilets), or the distribution of 2nd class water to toilet flushing separate to 1st class water that must be delivered to showers and wash hand basins. In some cases lack of space for a grey-water treatment plant could also render this option unfeasible, despite the fact that grey-water treatment plants do not require significant space. In these situations it would be highly beneficial for renovating hotels to ensure that their waste water collection systems for showers and wash-hand basins are separate from the toilet waste water collection, and that there exists a possibility to introduce a separate feed line for toilets. This would allow the hotel to implement grey-water treatment technology when renovating. New hotels should also be built with this infrastructure already in place, allowing operators the possibility of introducing grey-water treatment.

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ISLAND HOTELS
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ⁱ Based on advice issued by WaterSense of the US EPA (Environment Protection Agency):
http://www.epa.gov/WaterSense/pubs/faq_bs.html

ⁱⁱ Estimates on water usage: showers, 10 minutes per guest night; toilets, 4 full flushes per guest night; wash hand basins 1 minute of full flow per guest night