Life Cycle Analysis (1 of 2)

Life Cycle Inventory of Single-Trip and Multi-Trip Steel Drum Systems in the U.S., Europe, and Japan

The newly published life cycle analysis compares the environmental, energy and cost impacts of single-trip and multi-trip steel drums. This ground-breaking report was prepared by Franklin Associates, which is one of the most highly respected firms in the U.S. involved in this kind of work. The study reached several important conclusions:

1. The energy and environmental impacts of the multi-trip steel drum systems studied were significantly smaller than for the corresponding single-trip drum system; and
2. Net economic costs are lower for users of multi-trip steel drum systems than for users of single-trip steel drum systems.

The LCA quantifies the environmental and energy impacts of the most commonly used industrial packaging in the world – the steel drum. It considers energy use and environmental emissions associated with the production, reconditioning, recycling and disposal of these containers in the U.S., Europe and Japan. In addition, a framework was developed to compare net costs associated with the various drum systems.

Eight different combinations of tight head and open head 55 gallon steel drums were examined for each country or region – a total of 24 drum systems in all. The drums varied in weight (i.e., steel thickness) and in the average number of trips taken before recycling. Three drum systems were multi-trip and one was single-trip. The combinations were:

1.2 mm multi-trip tight head / open head
1.0 mm multi-trip tight head / open head
1.2/0.9/1.2 mm multi-trip tight head / open head
0.8 mm single-trip tight head / open head

Weights and trip rates were reported on the basis of 55,000 gallons of product delivered, or 1,000 trips. Trip rates for multi-trip drums ranged from a low of 2.3 (i.e. 1.0 mm tight head and open head in Japan) to a high of 8.7 (i.e. 1.2 mm open head in Europe). Some of the key study results from the report are summarized below:

1. The total energy requirements for multi-trip drums are significantly lower than for single-trip drums. The tight head multi-trip drum, for example, is nearly three times more energy efficient than single-trip drums in the U.S. and Europe, and about 65% more efficient in Japan. Open head multi-trip drums are 45% more efficient in Europe and the U.S., and about 22% more efficient in Japan.
2. Solid waste production associated with single-trip drum systems is about three to four times that associated with multi-trip systems in all countries.
3. Key atmospheric emissions for multi-trip tight head systems are substantially lower than for single-trip systems. These include particulates, nitrogen oxides and methane. Emissions from the open head multi-trip systems are also less than for the corresponding single-trip system, but the variance between the two is less than for the tight head systems.
4. Most waterborne emissions from multi-trip tight head drum systems are between 30% and 80% lower than for corresponding, single-trip tight head systems. Comparative waterborne emissions from open head systems fall within the same general ranges.
5. The net cost to users of single-trip drum systems is higher than for users of multi-trip drum systems. Savings from multi-trip systems averaged about 78% in the U.S.; nearly 67% in Europe; and, about 42% in Japan. Energy savings from multi-trip open head systems averaged about 67% in the U.S.; 63% in Europe and 33% in Japan. Although these cost values can rise or fall depending on variables such as fuel and the scrap value of steel, it is clear that energy savings from multi-trip systems will always be significant.

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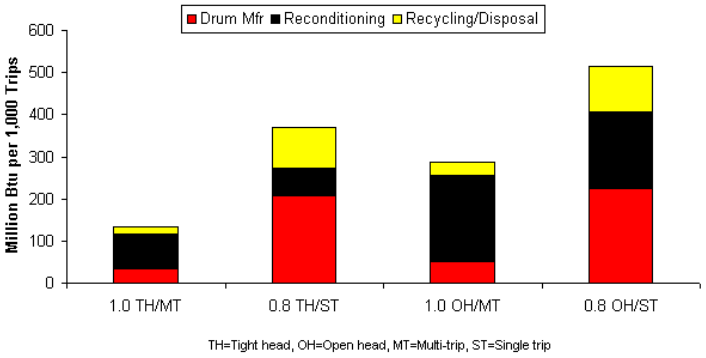
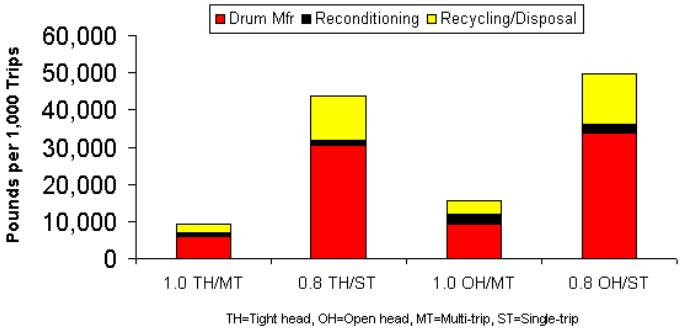
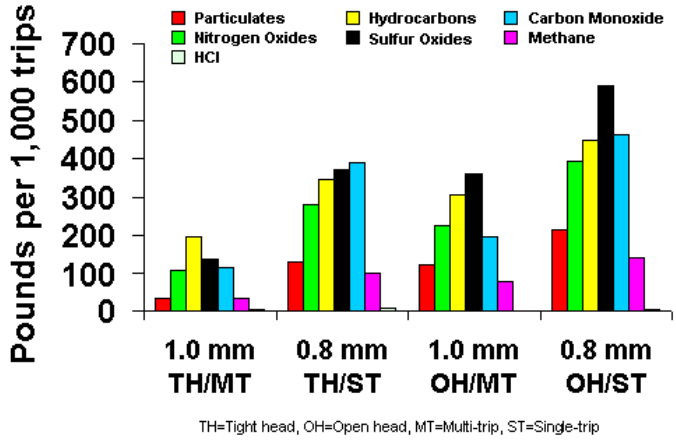
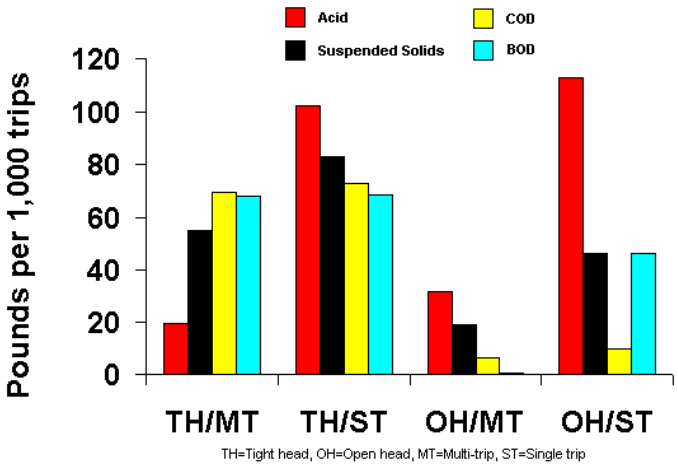
For simplicity, the charts below compare the savings between one of the multi-trip drums and the 0.8 mm single-trip drum. Since the results for the multi-trip systems were similar, we chose to use the 1.0 mm drum because of it's widespread use.









Cost Comparison (1.) (US $ per 1,000 drum trips)

Drum Style	Initial Cost (2.)	Transport Cost (3.)	Use Cost (4.)	Scrap Value (5.)	Net Cost (6.)
1.0 mm Tight Head	1,831	205	220	236	2,021
1.0 mm Open Head	2,937	297	508	379	3,362
0.8 mm Tight Head	9,598	266	220	1,232	8,852
0.8 mm Open Head	10,613	328	508	1,364	10,084

1. All costs expressed in US dollars, based on public data prices of fuels and materials.
2. Costs of steel and energy for producing the weight of steel drums and lids required for 1,000 trips based on average trip rate.
3. Cost of fuel for transportation to and from reconditioners for 1,000 drum trips. Includes initial transportation of new drums to user.
4. Cost of fuels and chemicals used in reconditioning process.
5. Value of steel scrap from drums required for 1,000 trips.
6. Net cost = initial cost + transportation costs + use costs - scrap value.