Heat Loss and Energy Consumption in Immersion and Ultrasonic Washers

Lowering wash temperatures from 160°F (71°C) to 120°F (49°C) in one 600-gallon immersion washer can reduce energy costs by $2,273.00 per year. (Check out the data at the end of this article)

Industrial in-process washing of machined, stamped, or fabricated parts is often accomplished in heat-ed immersion or ultrasonic tanks. Heat is applied to the water/ deter-gent mixture in the washer system to increase chemical action, soften soils, and control foam.

Typical in-process immersion wash-ing temperatures are from 140°F (60°C) to 180°F (82°C) with the most common recommendation being around 150°F to 160°F (66°C to 71°C).

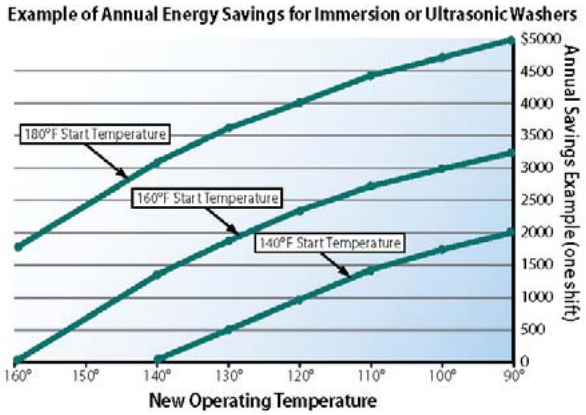
While heating has many benefits, it is also costly, and this cost impact is becoming more signficant as energy prices skyrocket.

Fortunately, twenty-first century chemical advances are making it possible to wash parts faster and with less heat than ever before. Since these new cleaner technolo-gies often cost more than older for-mulations, it is important to predict the cost savings that will be realized by reducing heat energy in the wash-ing process.

Washer systems lose heat energy in several ways:

- The parts being washed absorb heat from the washer and carry it out of the system.
- Heat is radiated from all surfaces of the washer.
- Usually the most significant heat energy loss comes from evapo-ration, which increases rapidly as the wash water temperature rises.

Potential savings of $2,273.00 per year!



To help our customer calculate the potential savings from reducing washer temperatures, we have re-searched proven engineering data and made it available in this bul-letin, and as a calculating spread-sheet on our CoolTools website.

The chart below gives an example of a 600-gallon immersion washer that is kept heated all workweek and shut off on weekends, using electric heat at $0.06/kWh.

To use this chart, First find the curve representing the starting washer temperature, then find the proposed lower washer tempera-ture on the bottom axis. The point along the curve where the new temperature intersects will give you an example of the annual sav-ings if you had a washer of similar size and similar energy costs.

Please note that the results are for steady-state operation and do not include the cost of bringing a cold washer bath up to temperature at the start of each workday, or the cost of holding the washer bath at operating temperature during weekends.

ADDITIONAL BENEFITS OF LOWER-ING WASH TEMPERATURE:

Saving a bundle on electricity or natural gas is the number one sav-ings from lowering wash tempera-ture but there are several other benefits:

1. Water evaporation from wash-ers increases exponentially with temperature.
   - If you are using tap water, the minerals in the water are left behind, rapidly increas-ing water hardness which consumes cleaner chemistry and shortens bath life. This results in increased chemical and disposal costs.
   - If you are using deionized or R-O water, your water treatment costs also go up directly with temperature.
2. Heating aggravates problems with staining or smutting alumi-num, brass, and zinc.

APPLY THIS DATA TO OTHER WASHING SYSTEMS:

The figures given in the graph above are specific to the particular washer and energy cost we used to calculate it. We have created a spreadsheet to calculate annual en-ergy costs for electric and natural gas heated tanks. The spreadsheet is based on accepted engineering data. Your Master Chemical dis-tributor or District Manager can access this spreadsheet to calculate approximate savings for you. You can also request an analysis from us by e-mailing info@master-stages.com.

You will have to send us the follow-ing data:

1. Tank capacity in gallons
2. Open surface dimensions (water surface)
3. Hours/week that the washer heater is switched on
4. Energy cost in $/kWh or $/CCF
5. If tank walls are insulated, how many inches of insulation?
6. Original operating temperature (rounded to nearest 10°F)
7. Proposed operating tempera-ture (rounded to nearest 10°F)
8. Description of part to be washed, including metals and soils
9. Current wash cycle time

If you have a spray washer, please see our technical bulletin ***"Heat Loss and Energy Consumption in Spray Washers"*** which is avail-able from your Master Chemical representative.

EXAMPLE DATA:

Washer:

1. Uninsulated tank with open top 60" x 48"
2. Water capacity: 600 gallons
3. Heating method: Thermostatic control, electric immersion heaters
4. Duty cycle: Washers are heated 132 hrs/week
5. Electricity cost/kWh: $0.06

	@ 160°F	@ 120°F	Savings	
BTU/Hr loss from open surface	26,200	9,400	16,800	(64%)
BTU/Hr loss from sides and bottom of tank	5,884	3,082	2,802	(48%)
Total BTU/Hr loss	32,084	12,482	19,602	(61%)
Energy Cost/Year	$3,720.45	$1,447.41	$2,273.04	(61%)

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