

## Cleaning Cost Calculation Worksheet

user input denoted by box --->  
all other fields locked

### Manual Parts Washer

#### Carburetors with Mineral Spirits

#### Variable

#### Value

#### units

#### General

|   |                                  |              |
|---|----------------------------------|--------------|
| cycle time for manual parts washer            | <input type="text" value="18"/>  | min/cycle    |
| load/unload time                              | <input type="text" value="1"/>   | min/cycle    |
| <i>total cycle time</i>                       | 19                               | min/cycle    |
| tank capacity                                 | <input type="text" value="42"/>  | gallons/drum |
| batch size                                    | <input type="text" value="1"/>   | parts/batch  |
| # batches per day                             | <input type="text" value="44"/>  | batches/day  |
| lifetime of cleaning bath (changeover period) | <input type="text" value="300"/> | # cycles     |
| working days per week                         | <input type="text" value="5"/>   | days/week    |
| working weeks per year                        | <input type="text" value="50"/>  | weeks/year   |
| <i>batches cleaned per year</i>               | 11000                            | batches/year |
| <i>parts cleaned per year</i>                 | 11000                            | parts/year   |

#### Energy

|   |                                     |                |
|---|-------------------------------------|----------------|
| average power requirement while operating | <input type="text" value="0.2"/>    | KW             |
| average run time per work day             | <input type="text" value="8"/>      | hours/day      |
| <i>total energy consumed per work day</i> | 1.60                                | KWH/day        |
| cost of electricity                       | <input type="text" value="\$0.10"/> | \$/KWH         |
| <i>cost of energy per day</i>             | \$0.16                              | \$/cycle       |
| <b><i>annual cost of energy</i></b>       | <b>\$40</b>                         | <b>\$/year</b> |

#### Labor

|                                    |                                      |                |
|------------------------------------|--------------------------------------|----------------|
| direct labor hours per cycle       | 19                                   | min/cycle      |
| direct labor hours per changeover  | <input type="text" value="30"/>      | min/changeover |
| <i>total labor hours per cycle</i> | 19.1                                 | min/cycle      |
| fully burdened labor rate          | <input type="text" value="\$15.00"/> | \$/hour        |
| <i>cost of labor per cycle</i>     | \$4.78                               | \$/cycle       |
| <b><i>annual cost of labor</i></b> | <b>\$52,525</b>                      | <b>\$/year</b> |

#### Materials

|   |                                       |                  |
|---|---------------------------------------|------------------|
| purchase and disposal cost per drum         | <input type="text" value="\$130.00"/> | \$/42-gal drum   |
| <i>number of changeovers per year</i>       | 37                                    | changeovers/year |
| <b><i>total materials cost per year</i></b> | <b>\$4,767</b>                        | <b>\$/year</b>   |

#### Waste Disposal

|   |            |                |
|---|------------|----------------|
| <b><i>waste disposal cost included in lease</i></b> | <b>\$0</b> | <b>\$/year</b> |
|---|------------|----------------|

#### Capital Costs

|  |            |                |
|--|------------|----------------|
| <b><i>leased equipment - no capital cost</i></b> | <b>\$0</b> | <b>\$/year</b> |
|--|------------|----------------|

#### Maintenance Costs

|  |            |                |
|--|------------|----------------|
| <b><i>maintenance cost included in lease</i></b> | <b>\$0</b> | <b>\$/year</b> |
|--|------------|----------------|

**Cost of Quality**

|   |                 |                |
|---|-----------------|----------------|
| fraction of cleaned parts returned for recleaning | 1.00%           | %              |
| cost of warranty returns                          | \$200.00        | \$/part        |
| fraction of warranty returns related to cleaning  | 0.50%           | %              |
| fraction of parts damaged in cleaning             | 2.34%           | %              |
| resale value of parts                             | \$100.00        | \$/part        |
| <i>parts cleaned per batch</i>                    | 0.99            | parts/batch    |
| <i>parts cleaned per year</i>                     | 10,890          | parts/year     |
| <i>annual warranty returns due to cleaning</i>    | 54              | parts/year     |
| <i>parts damaged in cleaning</i>                  | 255             | parts/year     |
| <i>saleable parts cleaned per year</i>            | 10,635          | parts/year     |
| <i>annual cost of warranty returns</i>            | \$10,800        | \$/year        |
| <i>lost revenue from damaged parts</i>            | \$25,500        | \$/year        |
| <b><i>annual cost of quality</i></b>              | <b>\$36,300</b> | <b>\$/year</b> |

**Other Costs**

|                           |                |                |
|---------------------------|----------------|----------------|
| liability insurance       | \$500          | \$/year        |
| regulatory compliance     | \$500          | \$/year        |
| fire insurance            | \$300          | \$/year        |
| <b><i>other costs</i></b> | <b>\$1,300</b> | <b>\$/year</b> |

**Summary - Annual Basis**

|  |                 |                |
|--|-----------------|----------------|
| <i>energy</i>                              | \$40            | \$/year        |
| <i>labor</i>                               | \$52,525        | \$/year        |
| <i>materials</i>                           | \$4,767         | \$/year        |
| <i>waste disposal</i>                      | \$0             | \$/year        |
| <i>capital costs</i>                       | \$0             | \$/year        |
| <i>maintenance</i>                         | \$0             | \$/year        |
| <i>cost of quality</i>                     | \$36,300        | \$/year        |
| <i>other costs</i>                         | \$1,300         | \$/year        |
| <b><i>TOTAL CLEANING COST PER YEAR</i></b> | <b>\$94,932</b> | <b>\$/year</b> |

**Summary - Per Part Basis**

|  |               |                |
|--|---------------|----------------|
| <i>energy</i>                              | \$0.0038      | \$/part        |
| <i>labor</i>                               | \$4.9389      | \$/part        |
| <i>materials</i>                           | \$0.4482      | \$/part        |
| <i>waste disposal</i>                      | \$0.0000      | \$/part        |
| <i>capital costs</i>                       | \$0.0000      | \$/part        |
| <i>maintenance</i>                         | \$0.0000      | \$/part        |
| <i>cost of quality</i>                     | \$3.4133      | \$/part        |
| <i>other costs</i>                         | \$0.1222      | \$/part        |
| <b><i>TOTAL CLEANING COST PER PART</i></b> | <b>\$8.93</b> | <b>\$/year</b> |