

**Welding
Duty Cycle Worksheet**

Name

Key

1. Find the operating time for a machine with a 20% duty cycle at 100 amps.

2 minutes

$$\begin{aligned} 20\% \times 10 \text{ min} \\ .2 \times 10 \\ 2 \end{aligned}$$

2. Find the operating time for a machine with a 60% duty cycle at 350 amps.

6 minutes

$$\begin{aligned} 60\% \times 10 \text{ min} \\ .6 \times 10 \\ 6 \end{aligned}$$

3. Find the operating time for a machine with a 60% duty cycle at 200 amps.

6 minutes

$$\begin{aligned} 60\% \times 10 \text{ min} \\ .6 \times 10 \\ 6 \end{aligned}$$

4. A \$45 item is on sale for 20% off. Sales tax is 6%. How much is the item going to cost?

\$38.16

$$\begin{aligned} 100\% - 20\% = 80\% \\ .8 (45) \\ \$36 \end{aligned}$$

$$\begin{aligned} 100\% + 6\% \text{ sales tax} = 106\% \\ 1.06 (36) \\ \$38.16 \end{aligned}$$

5. A \$250 item is on sale for 30% off. As an employee, you get a 15% discount as well. Sales tax is 6%. How much is the item going to cost?

\$157.68

$$\begin{aligned} 100\% - 30\% = 70\% \\ .7 (250) \\ 175 \end{aligned}$$

$$\begin{aligned} 100\% - 15\% = 85\% \\ .85 (175) \\ 148.75 \end{aligned}$$

$$\begin{aligned} 100\% + 6\% = 106\% \\ 1.06 (148.75) \\ \$157.68 \end{aligned}$$

6. A bill at a restaurant is \$25.95 with tax. How much money should you leave for a 15% tip?

\$3.89

$$\begin{aligned} 15\% \times 25.95 \\ .15 (25.95) \\ 3.89 \end{aligned}$$

7. If you have a machine rated 60% at 150 amps and need to work at 250 amps, how long will you be able to operate the machine with it overheating?

2 minutes

$$\begin{aligned} 60\% \left(\frac{150}{250} \right)^2 \\ .6 (.6)^2 \\ .6 (.36) \\ .216 \\ 22\% \end{aligned}$$

$$\begin{aligned} 22\% \times 10 \text{ min} \\ 2.2 \end{aligned}$$

8. If you have a machine rated 60% at 100 amps and only need 80 amps for the job, how long will you be able to operate the machine before burning out the transformer?

$$60\% \left(\frac{100}{80} \right)^2$$

$$.6 (1.25)^2$$

$$.6 (1.5625)$$

$$.9375$$

$$94\%$$

$$94\% \times 10 \text{ min}$$

$$9.4$$

9 minutes

9. If you have a machine rated 90% at 120 amps and need to work at 175 amps for the job, how long will you be able to operate the machine before burning out the transformer?

$$90\% \left(\frac{120}{175} \right)^2$$

$$.9 (.6857)^2$$

$$.9 (.4702) = .423$$

$$42\%$$

$$42\% \times 10 \text{ min}$$

$$4.2$$

4 minutes

10. If you have a machine rated 90% at 175 amps and need to work at 225 amps for the job, how long will you be able to operate the machine before burning out the transformer?

$$90\% \left(\frac{175}{225} \right)^2$$

$$.9 (.7)^2$$

$$.9 (.49)$$

$$.54 = 54\%$$

$$54\% \times 10 \text{ min}$$

$$5.4$$

5 minutes

11. There are two welding machines in a shop. One has a duty cycle rating of 60% at 135 amperage while the other machine has a 90% duty cycle at 150 amps. You are planning a job that needs to operate at 195 amps and need to get it done as soon as possible. Which machine should you use? Show your work and give an explanation.

Machine 1

$$60\% \left(\frac{135}{195} \right)^2$$

$$.6 (.6923)^2$$

$$.6 (.4793)$$

$$.2876$$

$$29\%$$

$$29\% \times 10 \text{ min}$$

$$2.9$$

$$2 \text{ min}$$

Machine 2

$$90\% \left(\frac{150}{195} \right)^2$$

$$.9 (.7692)^2$$

$$.9 (.5917)$$

$$.5325$$

$$53\%$$

Machine 2 90% at 150
amps because you
can work longer
before it overheats.

$$53\% \times 10 \text{ min} = .53 \times 10 = 5.3 \text{ min}$$

12. There are two welding machines in a shop. One has a duty cycle rating of 60% at 150 amperage while the other machine has a 100% duty cycle at 125 amps. You are planning a job that needs to operate at 175 amps and need to get it done as soon as possible. Which machine should you use? Show your work and give an explanation.

Machine 1

$$60\% \left(\frac{150}{175} \right)^2$$

$$.6 (.8571)^2$$

$$.6 (.7347)$$

$$.4408$$

$$44\%$$

$$.44 \times 10 \text{ min} = 4.4$$

$$4 \text{ min}$$

Machine 2

$$100\% \left(\frac{125}{175} \right)^2$$

$$1 (.7143)^2$$

$$1 (.5102)$$

$$.5102$$

$$51\%$$

$$.51 \times 10 \text{ min} = 5.1$$

$$5 \text{ min}$$

Machine 2
100% at 125 amps
because you can
work longer before
it overheats.