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Requirements: breakdown of Rental Cost, Variable Costs (excluding labour), Labour Costs and Recycling Costs. And a final recommendation.

Rental Cost: Machine A

1 time set up \$20 000.00

How many months do we need the machine for? Lets find out how many parts we need to make.

$$\# \text{ parts desired} = \text{Total} \# \text{ parts made} * (1 - \text{defect rate})$$

$$45\,000 \text{ parts} = \text{Total} \# \text{ parts made} * (1 - 0.045)$$

$$\text{Total} \# \text{ parts made} = \lceil 45\,000 \text{ parts} / 0.955 \rceil$$

$$= \lceil 47\,120.4 \text{ parts} \rceil$$

$$= \underline{47\,121 \text{ parts}}$$

So we know how many parts are required, how long will this take?

Well if machine A can produce 74 parts / hour

$$\begin{aligned} \text{Total hours required} &= 47\,121 \text{ parts} / 74 \text{ parts/hour} \\ &= 636.77 \text{ hours} \end{aligned}$$

Since there are 13 working hours per day (two 8 hour shifts minus breaks) 5 days per week and 4.3333 weeks per month we can determine how many months the machine needs to be rented for

$$636.77 \cancel{\text{h}} \times \frac{\cancel{\text{day}}}{13 \cancel{\text{h}}} \times \frac{\cancel{\text{week}}}{5 \cancel{\text{day}}} \times \frac{\text{month}}{4.3333 \cancel{\text{week}}} = 2.26 \text{ months}$$

Since the machine can only be rented for entire months it must be rented for 3 months at \$7500.00 / month

$$\text{Total rental cost} = \$20\,000.00 + 3(\$7\,500.00)$$

$$\boxed{\text{Total rental cost} = \$42\,500.00}$$

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Rental Cost: Machine B

Logic is exact same as Machine A. Here are the calculations.

1 time rental fee \$25 000.00

$$\begin{aligned}\text{Total \# parts made} &= 145\,000 \text{ parts} / 0.9027 \\ &= 149\,889.14 \text{ parts} \\ &= \underline{49\,890 \text{ parts}}\end{aligned}$$

$$\begin{aligned}\text{Total hours required} &= 49\,890 \text{ parts} / 98 \text{ parts/hour} \\ &= 509.08 \text{ hours}\end{aligned}$$

$$509.08 \text{ h} \times \frac{\text{day}}{13 \text{ h}} \times \frac{\text{week}}{5 \text{ day}} \times \frac{\text{month}}{4.3333 \text{ week}} = 1.81 \text{ months}$$

2 months of rental.

$$\text{Total Rental Cost} = \$25\,000.00 + 2 (\$8\,250.00)$$

$$\boxed{\text{Total Rental Cost} = \$41\,500.00}$$

Variable Cost: Machine A

$$\begin{aligned}\text{Fuel Cost} &= \text{Fuel per hour} \times \# \text{ hours machine runs} \\ &= 155.00 \$/\text{h} \times 636.77 \text{ h} \\ &= \$98\,699.35\end{aligned}$$

$$\begin{aligned}\text{Material Cost} &= \text{Total \# parts} \times 0.5 \text{ Kg/part} \times 1.42 \$/\text{Kg} \\ &= 47\,121 \text{ parts} \times 0.5 \text{ Kg/part} \times 1.42 \$/\text{Kg} \\ &= \$33\,455.91\end{aligned}$$

$$\begin{aligned}\text{Total Variable Cost} &= \text{Fuel Cost} + \text{Material Cost} \\ &= \boxed{\$132\,155.26}\end{aligned}$$

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Variable Cost: Machine B

$$\begin{aligned}\text{Fuel Cost} &= 140.00 \$/h \times 509.08 h \\ &= \underline{\$71\,271.20}\end{aligned}$$

$$\begin{aligned}\text{Material Cost} &= 49\,890 \text{ parts} \times 0.5 \text{ Kg/part} \times 1.42 \$/\text{Kg} \\ &= \underline{\$35\,421.90}\end{aligned}$$

$$\boxed{\text{Total Variable Cost} = \$106\,693.10}$$

Labour Cost: Machine A

Hours Worked per shift: 7 hours (8 hour shifts minus one hour un-paid lunch break). But 6.5 of actual work (with breaks).

$$\begin{aligned}\text{Total \# shifts} &= \lceil \text{Total \# hours} / 6.5 \text{ hours/shift} \rceil \\ &= \lceil 636.77 h / 6.5 h/\text{shift} \rceil \\ &= 98 \text{ shifts}\end{aligned}$$

$$\begin{aligned}\text{Total Labour Costs} &= 98 \text{ shifts} \times 7 h/\text{shift} \times 25 \$/h \\ &= \underline{\$17\,150.00}\end{aligned}$$

Machine B

$$\begin{aligned}\text{Total \# shifts} &= \lceil 509.08 h / 6.5 h/\text{shift} \rceil \\ &= 79 \text{ shifts}\end{aligned}$$

$$\begin{aligned}\text{Total Labour Costs} &= 79 \text{ shifts} \times 7 h/\text{shift} \times 25 \$/h \\ &= \underline{\$13\,825.00}\end{aligned}$$

Recycling Cost: Machine A

Machine A creates $47\,121 - 45\,000 = 2\,121$ defective parts. At 0.5 Kg per part this is 1060.5 Kg of recyclable material. Since the recycling truck can only carry a max of 1000 Kg this will require 2 trips

$$\begin{aligned}\text{Total Recycling Cost} &= 2 \times \$175 \\ &= \underline{\$350}\end{aligned}$$

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Recycling Cost: Machine B

$$\begin{aligned}\text{Defective Parts} &= 49\,890 - 45\,000 \\ &= 4\,890 \text{ parts}\end{aligned}$$

$$\begin{aligned}\text{Weight of Defective parts} &= 4\,890 \text{ parts} \times 0.5 \text{ Kg/part} \\ &= 2\,445 \text{ Kg}\end{aligned}$$

$$\begin{aligned}\text{Total Recycling Cost} &= 3 \times \$175 \\ &= \boxed{\$525}\end{aligned}$$

Total Cost Summary

	Machine A	Machine B
Rental Cost	\$42 500.00	\$41 500.00
Variable Cost	\$132 155.26	\$106 693.10
Labour Cost	\$17 150.00	\$13 825.00
Recycling Cost	\$ 350.00	\$ 525.00
Total Cost	\$192 155.26	\$162 543.10

Recommendation: Therefore the company should use Machine B

$$\begin{aligned}\text{Customer Cost Quote: } & \$162\,543.10 \times 1.68 \\ & = \$273\,072.41\end{aligned}$$

Rounding to the nearest thousand

$$\boxed{\text{Customer Cost Quote: } \$273\,000.00}$$