13.3. \( P = \$15 \text{ million} \)

\( n = 120 \text{ months} \)

\( i = 1\% \text{ /month} \)

\( \text{Revenue} = 12,000 \text{ phones / month} \times \$250 / \text{phone} \times \text{E} = \$3,000,000 / \text{month} \)

\( \text{Operating Cost} = (\$4,100,000 \text{E}^{1.8} / \text{month} \text{E} \text{E}) \)

\( \text{Capital Recovery} = \$15,000,000 \times (A/P, 1\%, 120) = \$215,250 / \text{month} \)

\[ \text{Break Even: Revenue} = \text{Cost} \]

\[ \$3,000,000E = \$400,000 E^{1.8} + \$215,250 \]

\[ E \approx 57\% \quad (\text{cost takes } 4 \times \text{average } \text{ life} \text{ of } \text{ cells}) \]

13.6. \( \text{Capacity} = 1,400,000 \text{ calls / year} \)

\( FC = \$775,000 / \text{ year} \)

\( VC = \$2 / \text{ call} \)

\( \text{Revenue} = \$3.5 / \text{ call} \)

\( X = \text{ calls / year} \)

\[ 3.5X = 2X + 775,000 \]

\[ X = 516,667 \]

2) \( \text{Percentage of Call Capacity} = \frac{516,667}{1,400,000} = 36.9\% \)
6) \[ FC = \$900,000/2 = \$450,000 \]

\[ VC = \$2/call \]

Number of calls = 500,000

Revenue/call = X

\[ 500,000 \times X = 2 \times (500,000) + 450,000 \]

X = \$2.90

3.1) \[ X = \text{miles per year} \]

\[ \text{Cost (Concrete)}/\text{year} = \$900,000 \left( \frac{AP(7,000,20)}{2} \right) + \$200 \times (\$4951 + 200X) \]

\[ \text{Cost (Oil)}/\text{year} = \frac{28/\text{barel}}{1 \text{ barel}} \times \frac{1 \text{ mile}}{X \text{ miles/yr}} \]

\[ = \$560 \times \text{X per yr} \]

Break Even: \[ \$4951 + 200X = \$560X \]

X = 236 miles
Chapter 13, Solution 14.

Let \( x = \) hours per year

\[
-800(A/P, 10\%, 3) - \left( \frac{300}{2000} \right)x - 1.0x = -1,900(A/P, 10\%, 5) - \left( \frac{700}{8000} \right)x - 1.0x
\]

\[
-800(0.40211) - 0.15x - 1.0x = -1,900(0.2638) - 0.0875x - 1.0x
\]

\[
0.0625x = 179.532
\]

\[
x = 2873 \text{ hours per year}
\]
Chapter 13, Solution 15.

Set \( AW_1 = AW_2 \) where \( P_2 \) = first cost of Proposal 2. The final term in \( AW_2 \) removes the repainting cost in year 8.

\[
-250,000(A/P, 12\%, 4) - 3,000 = - P_2(A/P, 12\%, 8) - 3,000(A/F, 12\%, 2) + 3,000(A/F, 12\%, 8)
\]

\[
-250,000(0.32923) - 3,000 = - P_2(0.2013) - 3,000(0.4717) + 3,000(0.0813)
\]

\[
-85,307.50 = - P_2(0.2013) - 1171.20
\]

\[
-84,136.30 = - P_2(0.2013)
\]

\[
P_2 = $417,965
\]