QUESTION:
Two processes (Process K and L) as given below can be used for producing a polymer that reduces friction loss in engines. Which process should be selected on the basis of an annual equivalent worth (AEW) analysis at an interest rate of 12 % per year, compounded quarterly?

<table>
<thead>
<tr>
<th></th>
<th>Process K</th>
<th>Process L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cost, $</td>
<td>-160000</td>
<td>-210000</td>
</tr>
<tr>
<td>Operating cost per month, $/month</td>
<td>-7000</td>
<td>-5000</td>
</tr>
<tr>
<td>Salvage value, $</td>
<td>40000</td>
<td>26000</td>
</tr>
<tr>
<td>Life, years</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

SOLUTION:

Find $i_p$ effective interest rate per payment period (month) at the interest rate 12% compounded quarterly as follows:

$$K = 12, r = 12\%, M = 4 \text{ (quarterly)}, C = \frac{M}{K} = \frac{4}{12} = \frac{1}{3}$$

$$i_p = \left(1 + \frac{r}{M}\right)^{\frac{1}{M}} - 1 = \left(1 + \frac{0.12}{4}\right)^{\frac{1}{3}} - 1 = 0.0099 \text{ (0.99% per payment period (per month))}$$

$$AEW_{Process\ K} = -$160000\left(\frac{A}{F}, 0.99\%, 24\right) - $7000 + $40000\left(\frac{A}{F}, 0.99\%, 24\right)$$

$$AEW_{Process\ K} = -$160000\left[\frac{0.0099(1 + 0.0099)^{24}}{(1 + 0.0099)^{24} - 1}\right] - $7000 + $40000\left[\frac{0.0099}{(1 + 0.0099)^{24} - 1}\right]$$

$$AEW_{Process\ K} = -$13038.09$$

$$AEW_{Process\ L} = -$210000\left(\frac{A}{F}, 0.99\%, 48\right) - $5000 + $26000\left(\frac{A}{F}, 0.99\%, 48\right)$$

$$AEW_{Process\ L} = -$210000\left[\frac{0.0099(1 + 0.0099)^{48}}{(1 + 0.0099)^{48} - 1}\right] - $5000 + $26000\left[\frac{0.0099}{(1 + 0.0099)^{48} - 1}\right]$$

$$AEW_{Process\ L} = -$10091.99$$

(Factors equations were taken from Formula Table 3.4)

Select process L according to its higher annual equivalent worth (AEW):

$$AEW_{Process\ L} (-$10091.99) > AEW_{Process\ K} (-$13038.09)$$

or as annual equivalent cost:

$$AEC_{Process\ L} (10091.99) < AEC_{Process\ K} (13038.09)$$