Sample Calculations

See “Counterweight Position & Counterbalance Effect” for equations and nomenclature

1. Calculate ECB, given X (two different counterweight sizes)

Ex) Determine ECB for the 912-365-168 unit w/ (2) #1 cwts at position 70 & (2) #2 cwts at position 80 as measured w/ scale on crank arm. Stroke position is in the long stroke.

\[ CBTC = (2 \times 4354 \times 49.5) + (2 \times 53.54 \times 403) = 474,199 \text{ inch lbs} \]

\[ CBT = (X_1 \times N \times W_1) + (X_2 \times N \times W_2) + CBTC; \text{ where } X \text{ is position of counterweight on crank arm} \]

\[ CBT = (70 \times 2 \times 5280) + (80 \times 2 \times 4211) + 474,199 = 1,887,159 \text{ inch lbs} \]

\[ CBE = \frac{CBT}{TF@90^\circ} + SU \quad (TF \text{ determined from API linkage dimensions}) \]

\[ CBE = \frac{1,887,159}{78.581} - 320 = 23,695 \text{ lbs ECB} \]

2. Calculate X, given ECB (two different counterweight sizes)

Ex) Determine counterweight position \( X_1 \) and \( X_2 \) for (2) #1 & (2) #2 cwts as measured w/ scale on crank arm for a desired ECB of 20,000 lbs. for the 912-365-168 w/ stroke in the long stroke position.

\[ CBT = (CBE - SU) \times TF@90^\circ \]

\[ CBT = (20,000 + 320) \times 78.581 = 1,596,766 \text{ inch lbs} \]

\[ CBTC = (2 \times 4354 \times 49.5) + (2 \times 53.54 \times 403) = 474,199 \text{ inch lbs} \]

Set a position of (2) #1 cwts at 70 inches, then calculate position of (2) #2 cwts

\[ X_2 = \frac{CBT - CBTC - (X_1 \times N \times W_1)}{(N \times W_2)} \]

\[ X_2 = \frac{1,596,766 - 474,199 - (70 \times 2 \times 5280); X_2 = 45.5 \text{ inches}}{(2 \times 4211)} \]