Multiobjective Design Optimization of Parabolic Trough Collectors

Mohamed Mahran Kasem

Aerospace Engineering Department, Cairo University, Giza 12613, Egypt,
School of Engineering and Applied Science, Nile University, Shaikh Zayed City 12588, Egypt
Email: mohamed.kasem@cu.edu.eg; mkasem@nu.edu.eg

Appendix A – Material volume of PTC

PTC material volume \((V_{ptc})\) = cover volume + receiver volume + reflector volume

cover tube volume

\[
V_c = A_c(D_{co} - D_{ci})
\]

receiver tube volume

\[
V_r = A_r(D_{ro} - D_{ri})
\]

Reflector thickness

\[
t_{ref} = 0.004
\]

Reflector perimeter \(^{40}\)

\[
P_{ref} = \frac{1}{2} \sqrt{W^2 + 16f^2} + \frac{W^2}{8f} \log \left( \frac{4f + \sqrt{W^2 + 16f^2}}{W} \right)
\]

Reflector volume

\[
V_{ref} = P_{ref} L t_{ref}
\]

\[
V_{ptc} = V_c + V_r + V_{ref}
\]