



Effectiveness/NTU Curves for Tubular Heat Exchangers

Definitions

$$m = (\text{mass flow rate}) / (\text{kg} / \text{s})$$

$$C = (\text{specific heat capacity}) / (\text{J} / (\text{kg} \text{ K}))$$

$$mC = (\text{heat capacity rate}) / (\text{W} / \text{K})$$

$$R = \frac{(\text{lower heat capacity rate})}{(\text{higher heat capacity rate})}$$

$$U = (\text{overall heat transfer coefficient}) / (\text{W} / (\text{m}^2 \text{ K}))$$

$$A = (\text{surface area for heat transfer}) / (\text{m}^2)$$

$$NTU = (\text{number of transfer units}) = \frac{U A}{(mC)_{\text{lower}}}$$

$$\varepsilon = (\text{effectiveness}) = \frac{(\text{temperature change of fluid with lower capacity rate})}{(\text{difference between entry temperatures of hot and cold fluids})}$$

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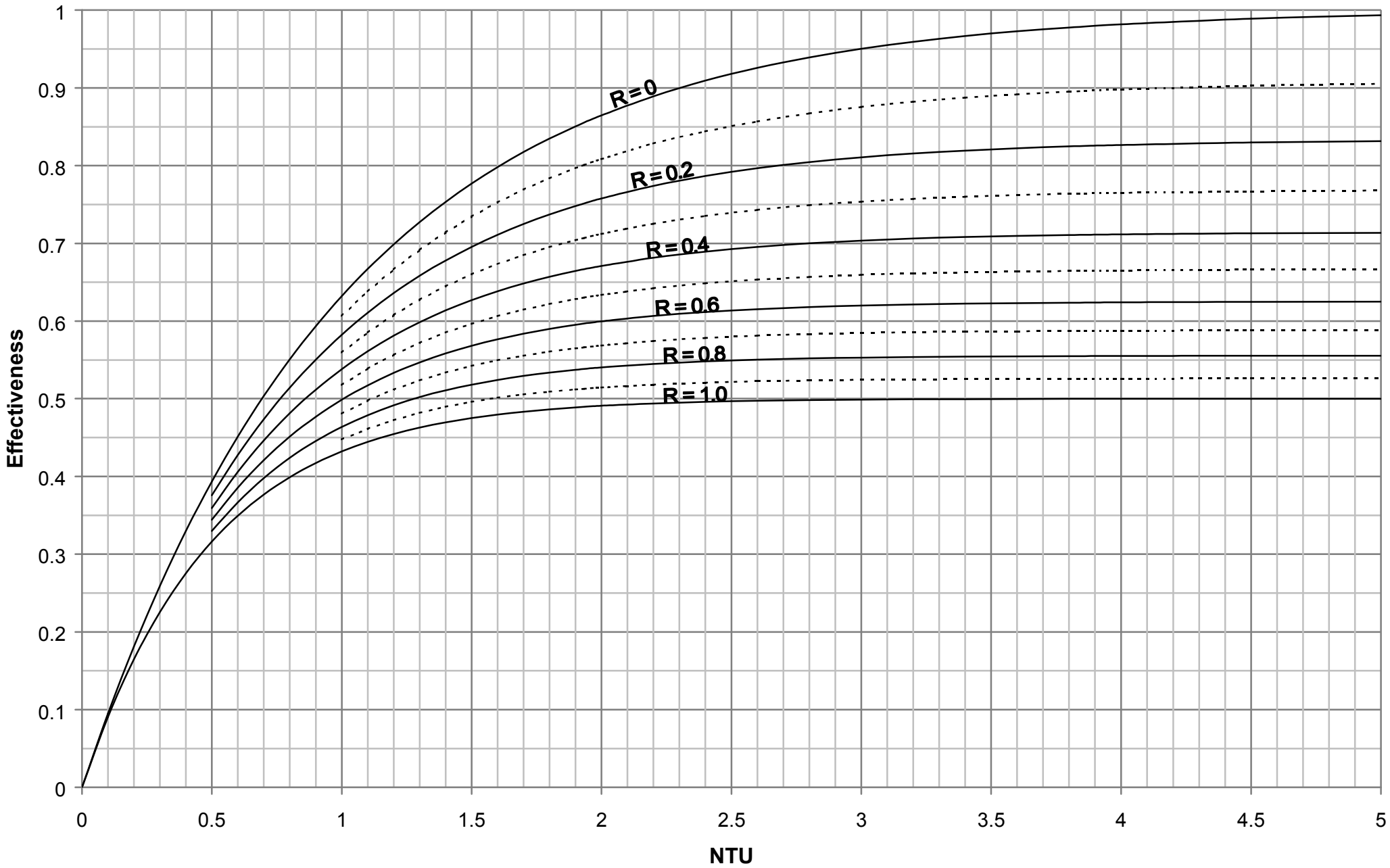
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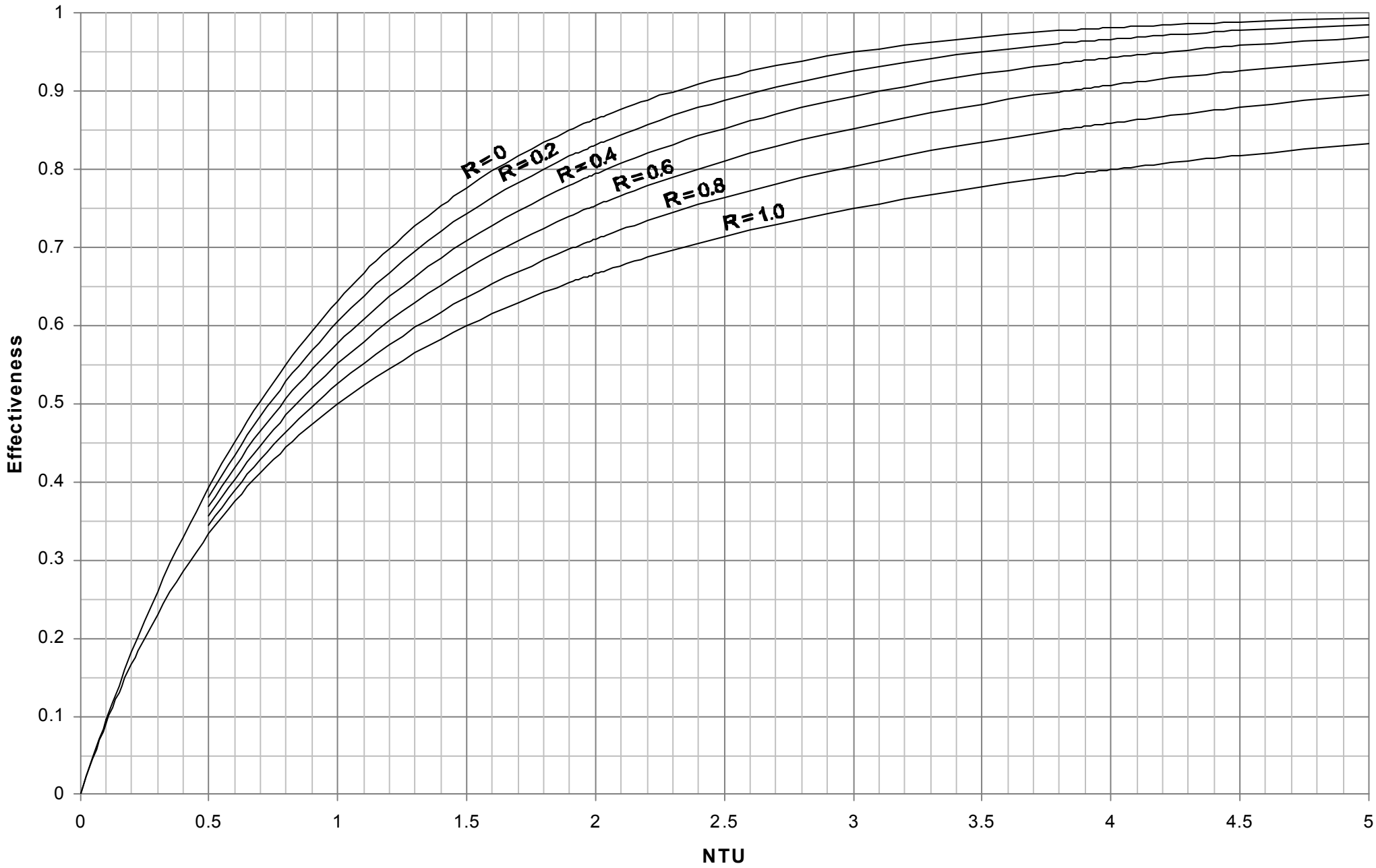
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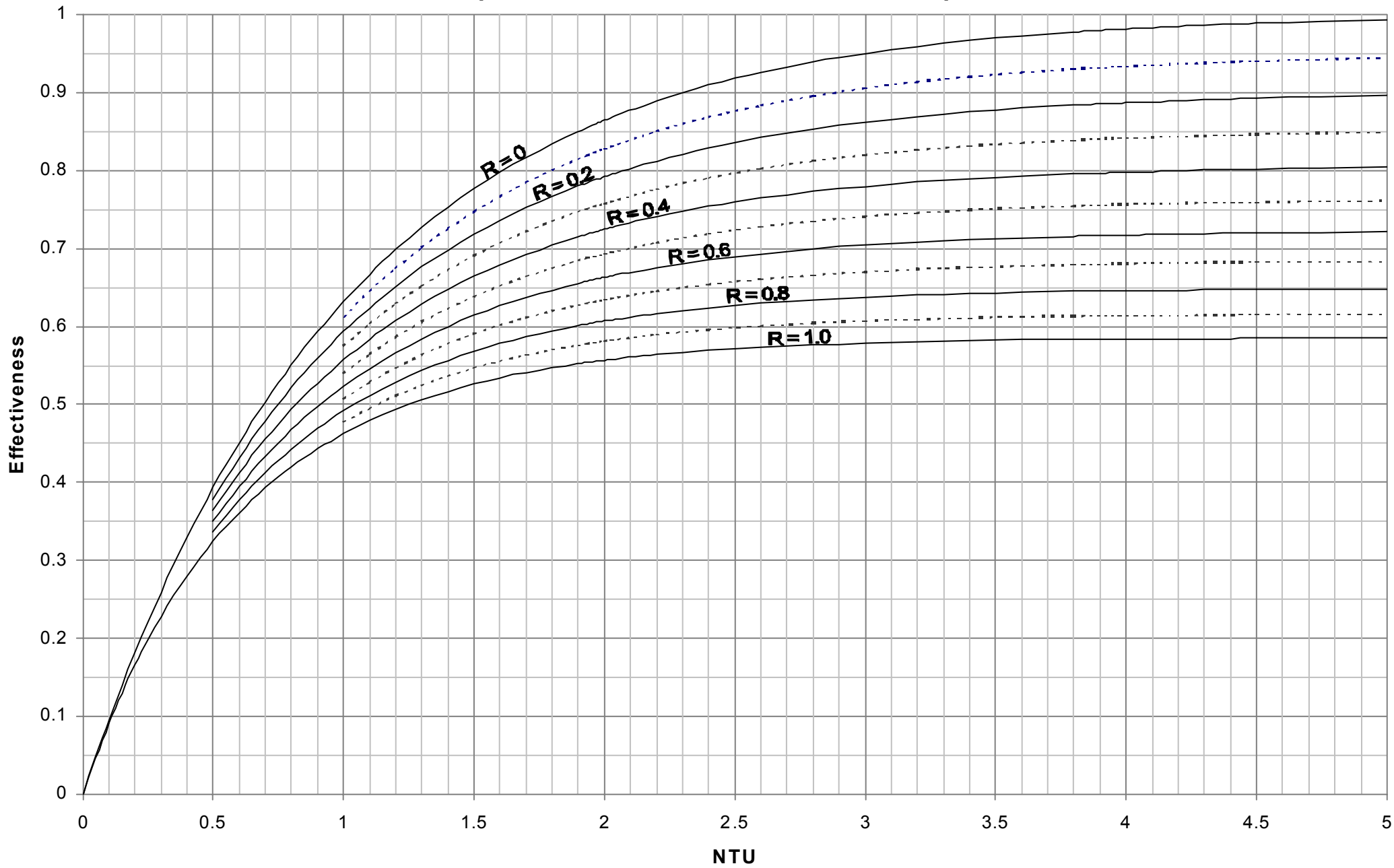
Effectiveness/NTU Curves: parallel flow



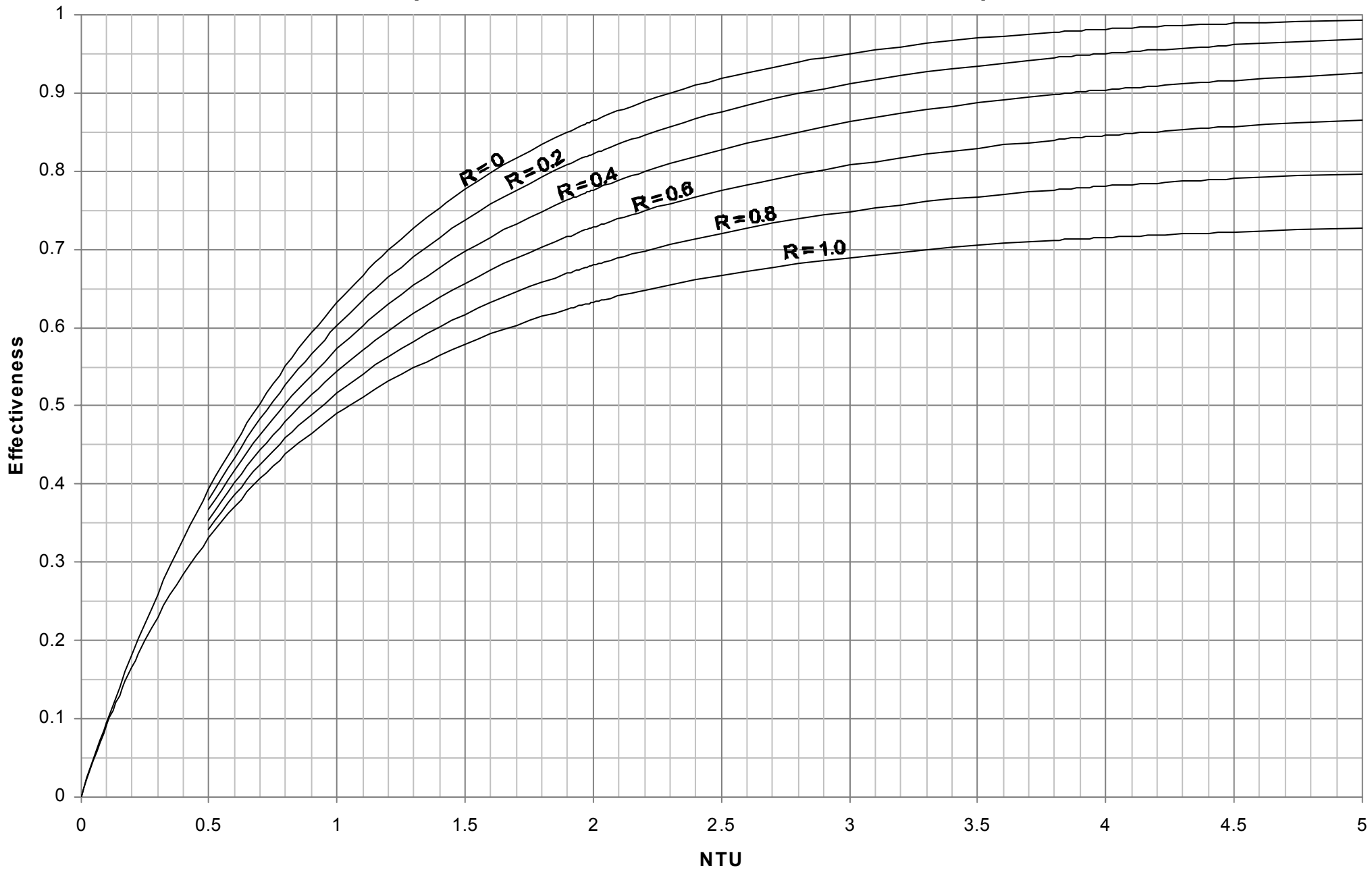
Effectiveness/NTU Curves: counter flow



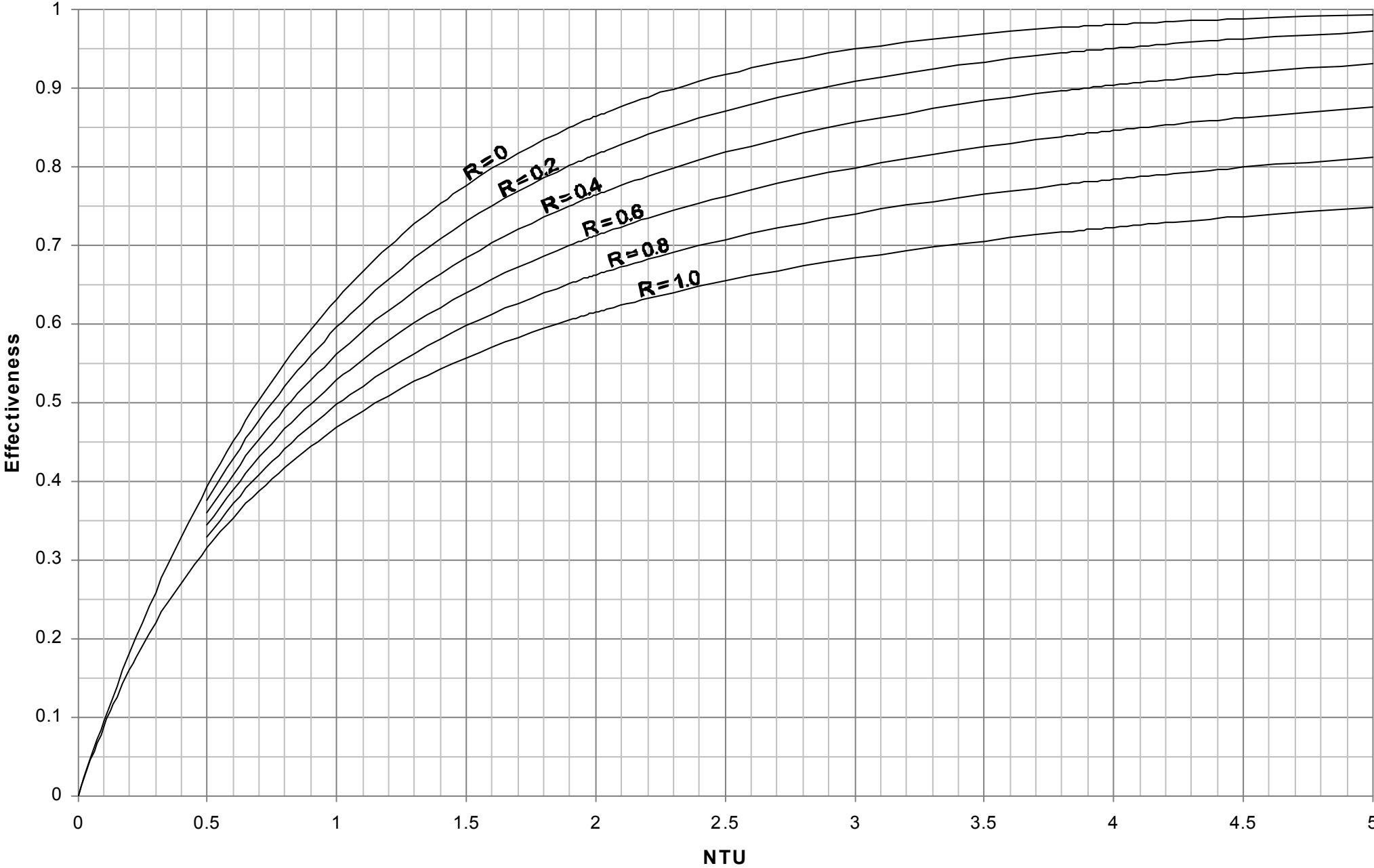
Effectiveness/NTU Curves: one shell pass and an even number of tube passes



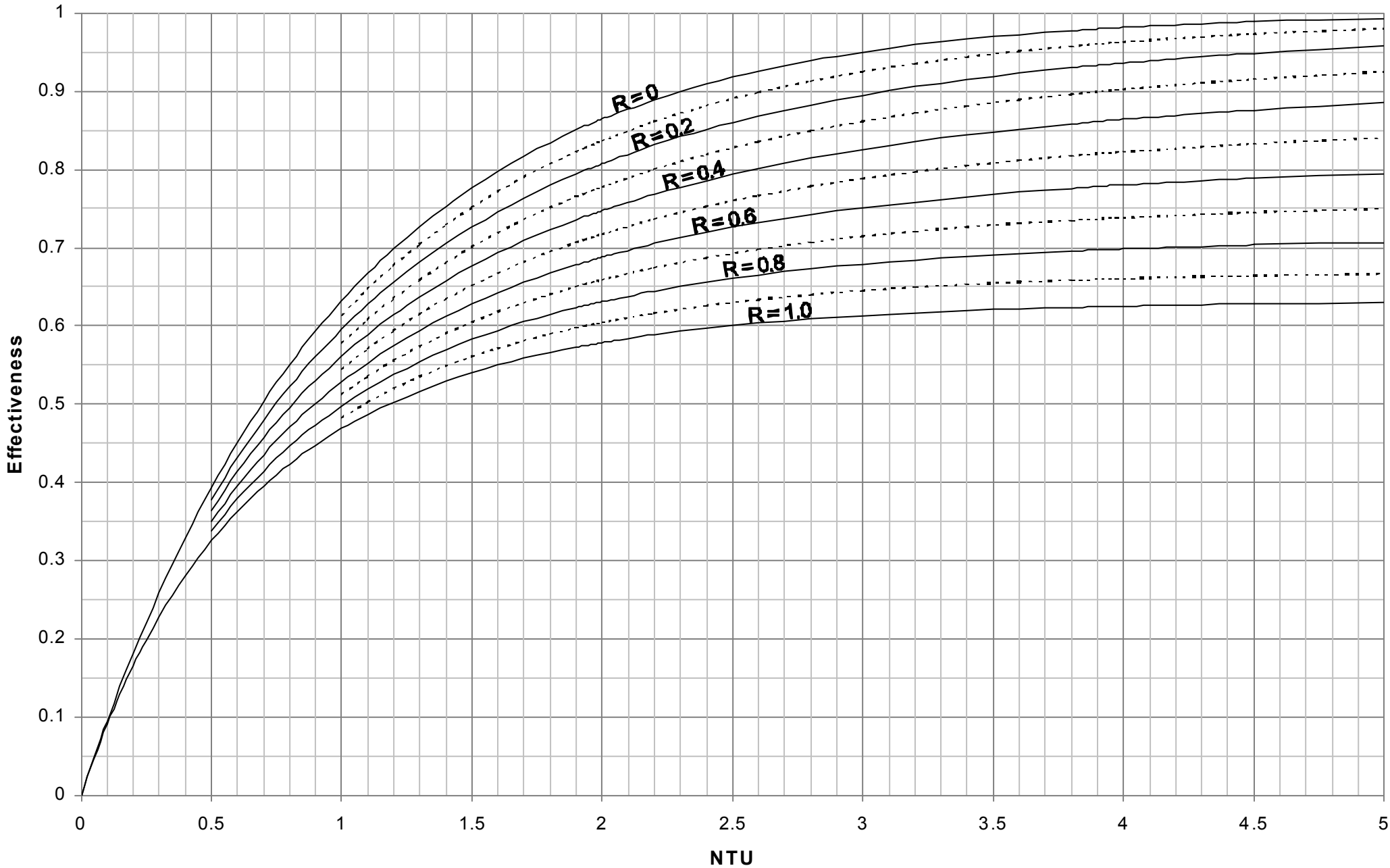
Effectiveness/NTU Curves: two shell passes and twice an even number of tube passes



**Effectiveness/NTU Curves:
cross flow - both fluids unmixed**



Effectiveness/NTU Curves: crossflow - lower capacity fluid mixed



Effectiveness/NTU Curves: crossflow - higher capacity fluid mixed

