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In[69]:= (*soudproudy a protiproudy vymenik pro rekuperaci tepla z vetraciho vzduchu*)
Quiet@Remove["Global`*"];
$HistoryLength = 2;
SetDirectory[NotebookDirectory[]];
SetAttributes[exp, {HoldAll, Listable}];
exp[co_] := Module[{a, graf}, a = ToString[Unevaluated[co]];
  graf := Evaluate[co]; Export[Evaluate[a <> ".png"], graf, ImageResolution -> 300];
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In[74]:= Tout = -10;
Tin = 20;
T1 = Tin;
T2 = Tout;
Δ1 = T1 - T4;
Δ2 = T3 - T2;
c = 1000;
Volume = 10 * 5 * 2.5;
timeOfAirExchange = 3 * 3600;

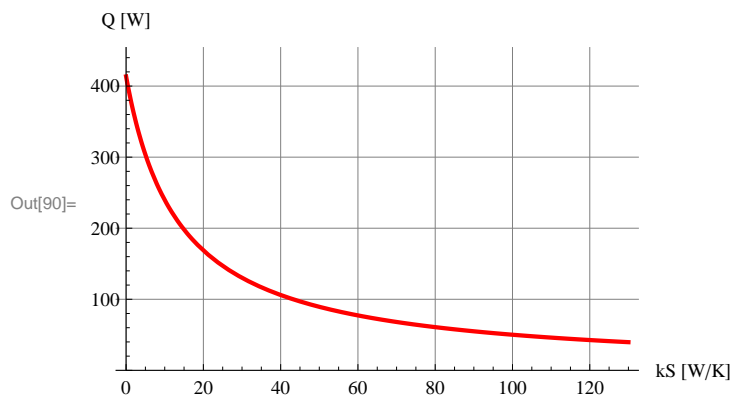
density =  $\frac{349}{Tin + 273}$ ;

massFlow =  $\frac{Volume * density}{timeOfAirExchange}$ ;
Print["massFlow= ", massFlow, " kg.s-1"]

eqns = {Q == kS *  $\frac{\Delta 1 + \Delta 2}{2}$ , Q == massFlow * c * (T1 - T3), Q == massFlow * c * (T4 - T2)};
QwithoutExchanger = massFlow * c * (Tin - Tout);
Print["needed heat for ventilation= ", QwithoutExchanger, " W"]
QwithHeatExchanger = massFlow * c * (Tin - T4) /. (Quiet@Solve[eqns])[1];
p11 = Plot[QwithHeatExchanger, {kS, 0, 130},
  PlotRange -> {Automatic, {0, 1.1 QwithoutExchanger}}, GridLines -> Automatic,
  PlotStyle -> {Thick, Red}, AxesLabel -> {"kS [W/K]", "Q [W]"}]
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massFlow= 0.0137862 kg.s⁻¹

needed heat for ventilation= 413.586 W



```
In[91]:= Δ1 = T1 - T2;
Δ2 = T3 - T4;

eqnsLog[kS_] := {Q == kS *  $\frac{\Delta 1 - \Delta 2}{\text{Log}[\frac{\Delta 1}{\Delta 2}]}$ , Q == massFlow * c * (T1 - T3), Q == massFlow * c * (T4 - T2)};

sol[kS_] := FindRoot[eqnsLog[kS], {Q, 300}, {T3, 15}, {T4, 10}];
sol[20]
```

Out[95]= {Q -> 195.431, T3 -> 5.82415, T4 -> 4.17585}

```

In[96]:= ClearAll[QwithHeatExchanger];
QwithoutExchanger = massFlow * c * (Tin - Tout);
Print["needed heat for ventilation= ", QwithoutExchanger, " W"]
QwithHeatExchanger[kS_] := massFlow * c * (Tin - T4) /. sol[kS];

```

needed heat for ventilation= 413.586 W

```

In[100]:= pl2 = Plot[QwithHeatExchanger[kS], {kS, 0, 130},
  PlotRange -> {Automatic, {0, 1.1 QwithoutExchanger}}, GridLines -> Automatic,
  PlotStyle -> {Thick, Blue}, AxesLabel -> {"kS [W/K]", "Q [W]"}];

In[101]:= plSouHaProti = Show[pl1, pl2]
exp[plSouHaProti];

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