

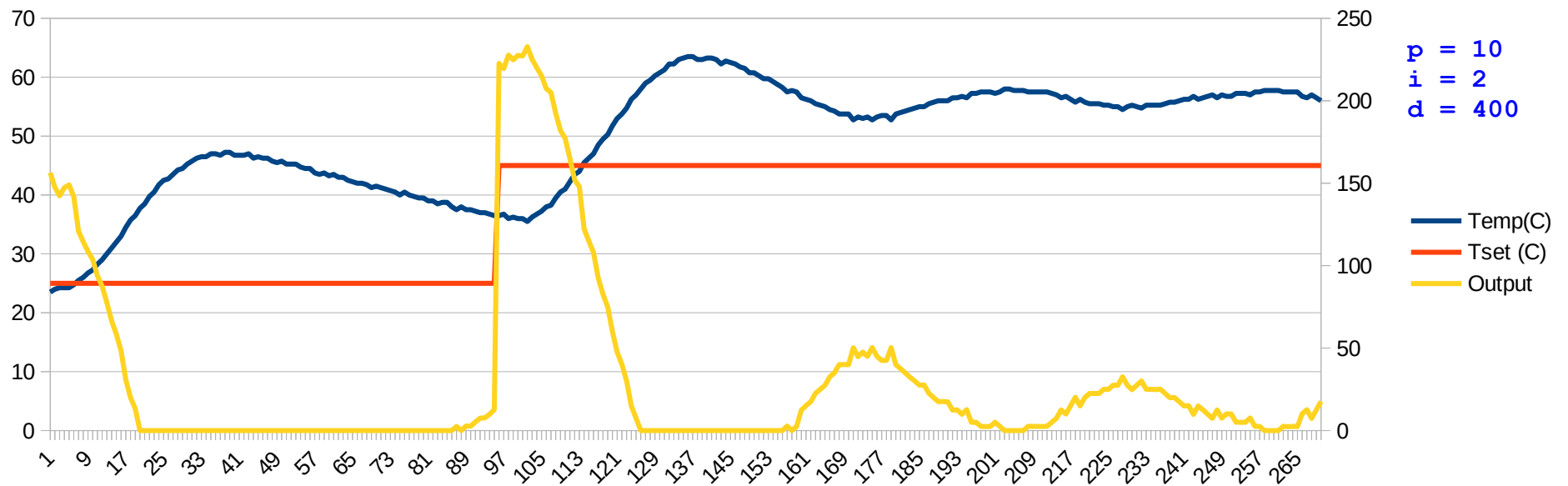
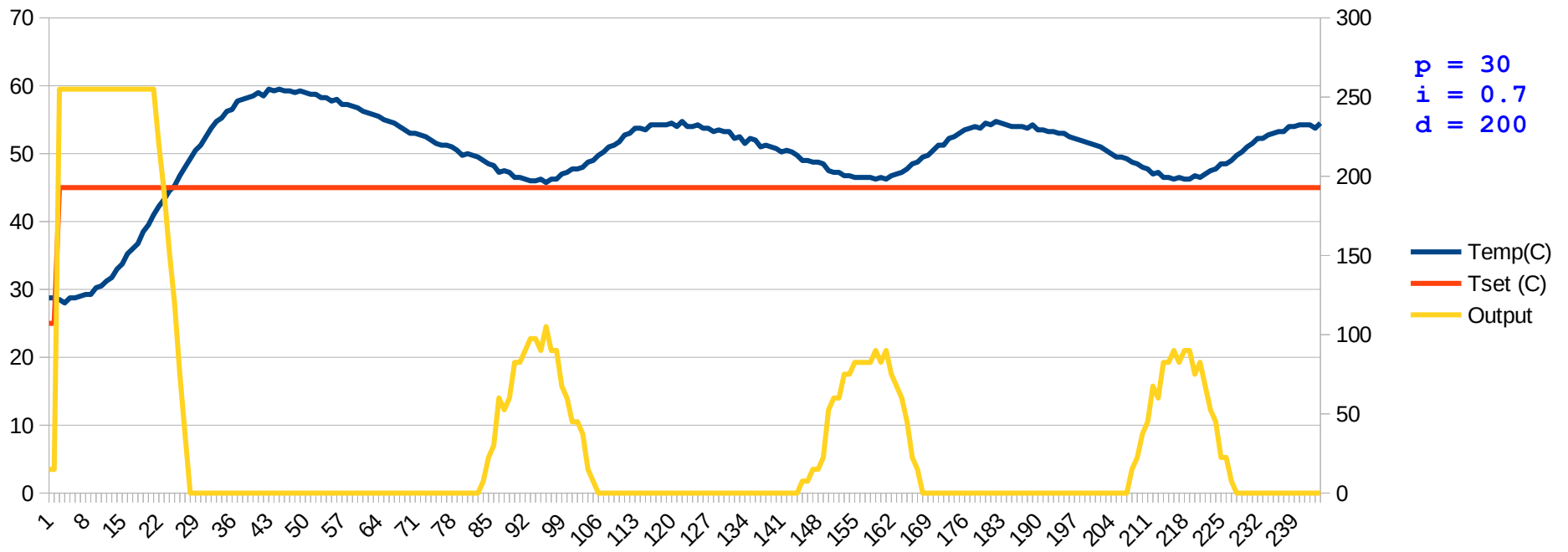
Test setup – ESP32 (C3 with display)
MAX6675 thermocouple
SSR on ESP pin
Glue gun controlled by SSR

Tests start with Tset = 25C (ambient is around 22-24C). Last test Tset=35C

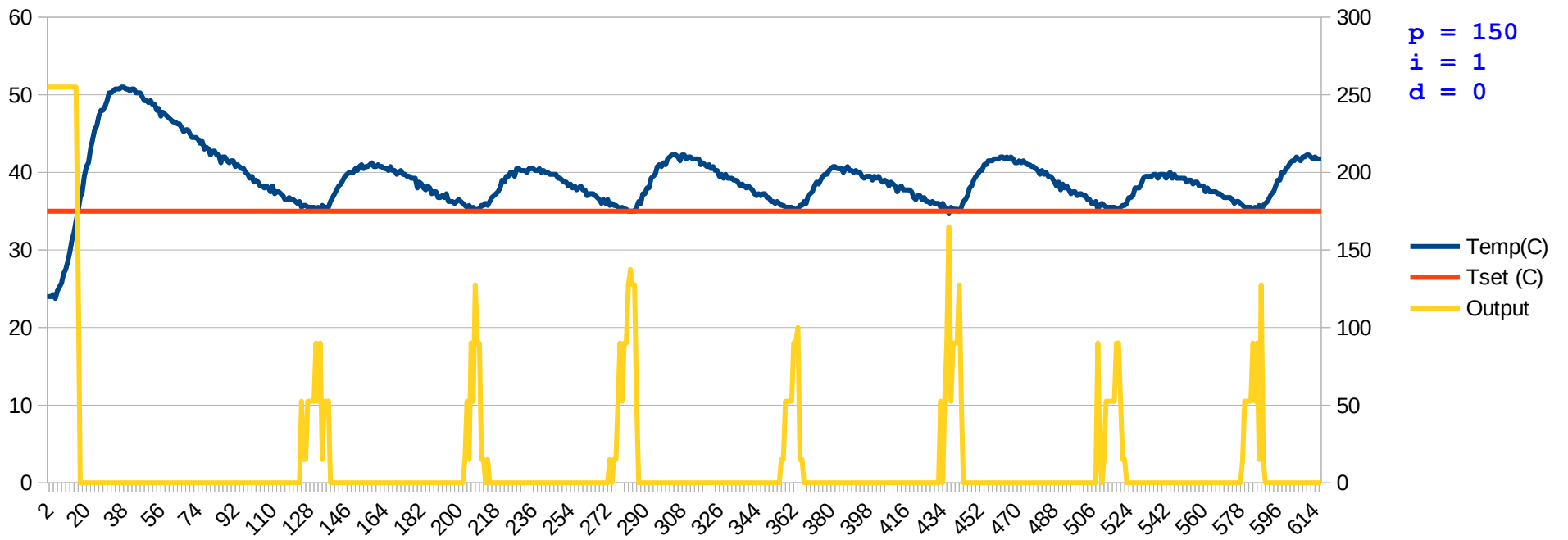
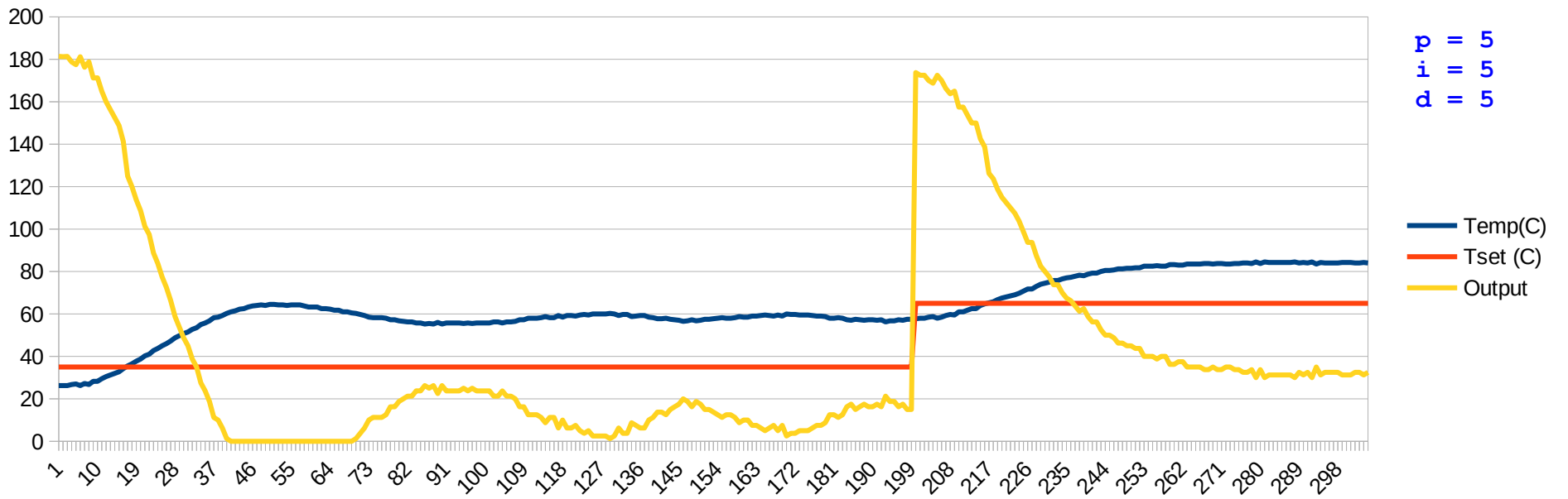
In charts output = 0-255 value input to analogWrite(BMCPIN, output)

Also – for ArdPID.h –

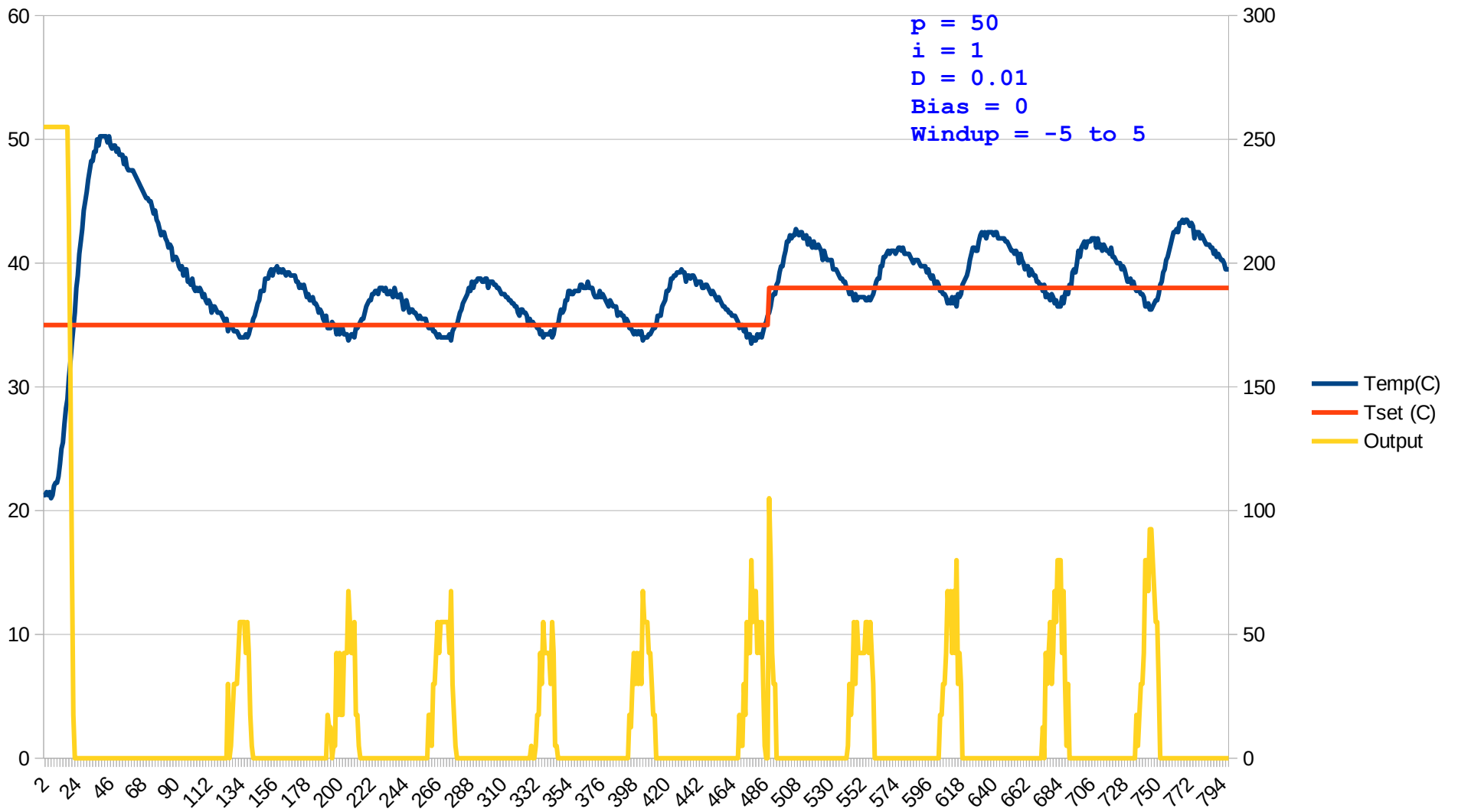
```
myController.begin(&input, &output, &setpoint, p, i, d);  
myController.setOutputLimits(0, 255);  
myController.setBias(255.0 / 2.0);  
myController.setWindUpLimits(-10, 10);
```



Had Bias set



Had Bias set



Bias set to 0

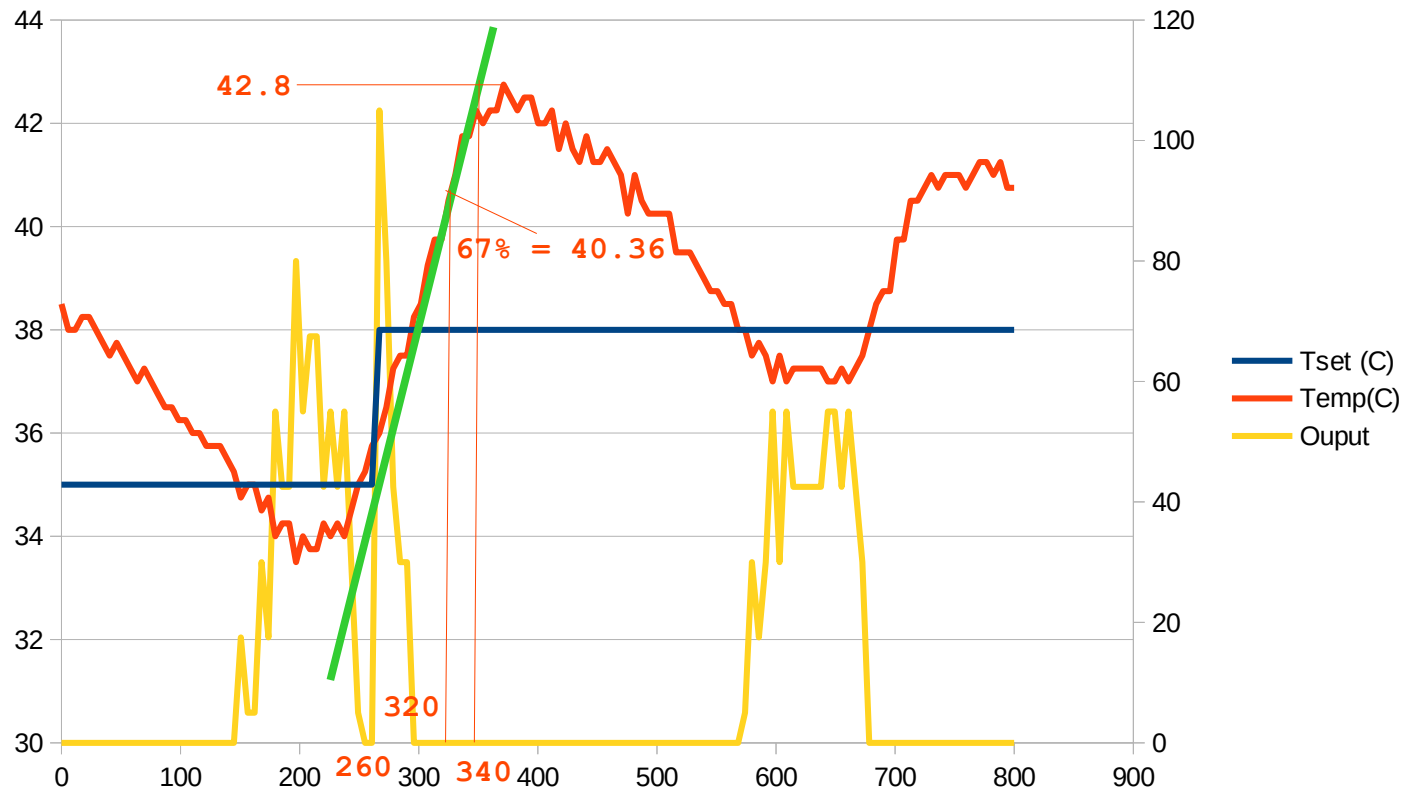
Cohen-Coon Tuning

www.opticontrols.com	Controller Gain	Integral Time	Derivative Time
P Controller:	$K_c = \frac{1.03}{g_p} \left(\frac{\tau}{t_d} + 0.34 \right)$		
PI Controller:	$K_c = \frac{0.9}{g_p} \left(\frac{\tau}{t_d} + 0.092 \right)$	$T_I = 3.33 t_d \frac{\tau + 0.092 t_d}{\tau + 2.22 t_d}$	
PD Controller:	$K_c = \frac{1.24}{g_p} \left(\frac{\tau}{t_d} + 0.129 \right)$		$T_D = 0.27 t_d \frac{\tau - 0.324 t_d}{\tau + 0.129 t_d}$
PID Controller: (Noninteracting)	$K_c = \frac{1.35}{g_p} \left(\frac{\tau}{t_d} + 0.185 \right)$	$T_I = 2.5 t_d \frac{\tau + 0.185 t_d}{\tau + 0.611 t_d}$	$T_D = 0.37 t_d \frac{\tau}{\tau + 0.185 t_d}$

Cohen-Coon Method

- Delta CO = 38/35 = 8.6%
- Delta PV = 42.8/35 = 22.3%
- gp = 22.3/8.6 = 2.593
- td = 340-260 = 80sec
- t = 20sec
- P constant
 $1.35/g_p * (t/t_d + 0.185) = 0.226$
 $P_{new} = 50 * 0.226 = 11.4$
- I constant
 $2.5 * t_d * ((t + 0.185 * t_d) / (t + 0.611 * t_d)) = 147.11$
 $I_{new} = 1 * 147.11 = 147.11$
- D constant
 $0.37 * t_d * (t / (t + 0.185 * t_d)) = 24.9789$
 $D_{new} = 0.01 * 24.9789 = 0.2497$

<https://blog.opticontrols.com/archives/383>



With tune parameters

P = 11.3
I = 147.11
D = 0.2497
Bias = 0
Windup = -5 to 5

