

# CTD-TUNE PLANT TUNING SUITE

Controller Tuning and Design, LLC - The Process Control Professionals!

This copy of CTD-TUNE is Licensed to:

**COMPANY LOGO**

YOUR ENERGY CENTER  
Site Address  
City, State Zip

MW Capacity  
Fuel Type

Serial Number: 1

**BETA TEST VERSION**



**Controller Tuning and Design, LLC**

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Welcome to the Controller Tuning & Design Tuning Suite.

Here you will find a complete set of tools that will aid in making your plant run smoother and more efficiently.

Description Dynamic Help

- Project
- Flow Meter
- Valve
- STM Steam Tables
- Misc Calculations
- Modeling
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# CTD-TUNE PLANT TUNING SUITE

New Meter

Project ID: Beta 1 Tag: 00FGS-FT0015A Description: Fuel Gas A Flow Meter

### Meter Installation Details

Meter Type: Orifice  
 Fluid Type: Gas  
 Measurement Location: Up Stream  
 Orifice Tap Type: Flange Taps  
 Pipe Material: Carbon  
 Orifice Material: Stainless Steel  
 Calibrated Meter

Bore Diameter: 4.387 inches  
 Pipe Inside Diameter: 6.038 inches

### Fluid Characteristics

Static Pressure: 125 psia  
 Fluid Temperature: 55 °F  
 Differential Pressure Units: in. w.c.  
 Differential Pressure: 132 in. w.c.  
 Desired Viscosity Units: Centipoise  
 Transmitter TOS: 435000

Notes: Beta test 1 of flow metering calculations

### Calculation Results

Beta Ratio:	0.7265651	Density:	62.413303	lbm/ft <sup>3</sup>
Corrected Beta Ratio:	0.7265362	Viscosity:	1.207128	Centipoise
Up Stream Reynolds Number:	377,124,015	Isentropic Exponent:	1.002294	
Down Stream Reynolds Number:	519,071,193	Volumetric Flow Rate:	6,972.198	ft <sup>3</sup> /hr
Discharge Coefficient:	0.60120	Mass Flow Rate:	435,157.899	lb/hr
Expansion Factor:	0.98072	Mass Flow Rate:	120.877	lb/sec

Calculate

Plot

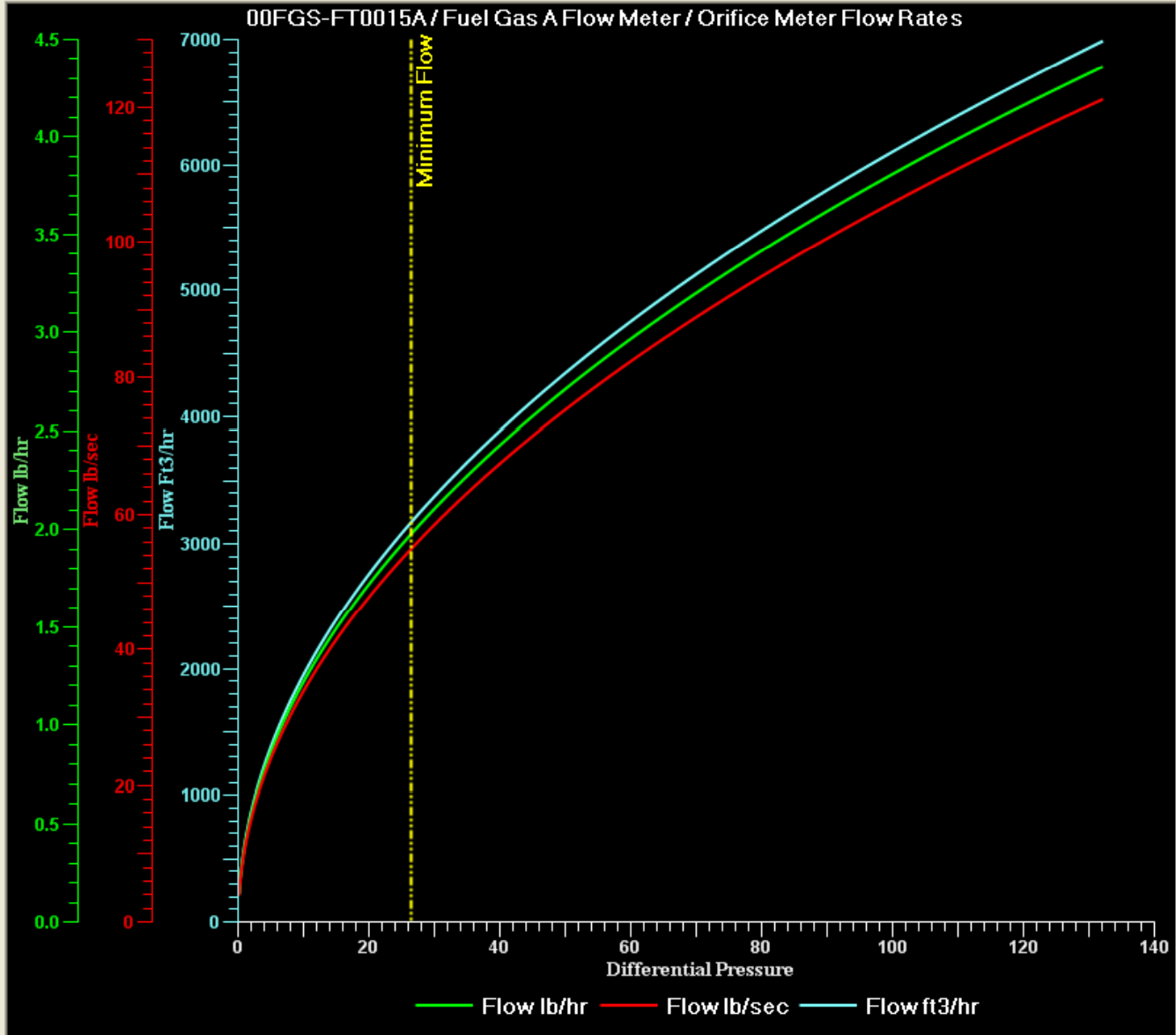
Print

In the Flow Metering module you will be able to verify the calibration of an existing primary flow element and the associated transmitter.

A detailed report will be produced showing exactly how this meter will perform over the entire load range.

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Save

# CTD-TUNE PLANT TUNING SUITE

## New Valve

Project ID:  Tag:  Description:

Calculate:  Fluid:

Valve Type:  Trim Type:  Flow Direction:

Characteristics:

Valve Stroke:  inches Min Flow:  kpph Turn Down Ratio:   
Cv max:  Max Flow:  kpph

### Process Parameters

Inlet Pressure:  Outlet Pressure:   
Inlet Temperature:  Outlet Temperature:   
Valve Cv:   
Valve Inlet Diameter:   
Valve Outlet Diameter:   
Inlet Reducer   
  
Outlet Expander

### Notes:

Beta test 1 of Valve calculations

### Calculation Results

dP:  dT:   
  
Cv:   
Reynolds Number:   
Fd:  Fs:   
Fl:  xt:   
Fr:  Cv/d^2:

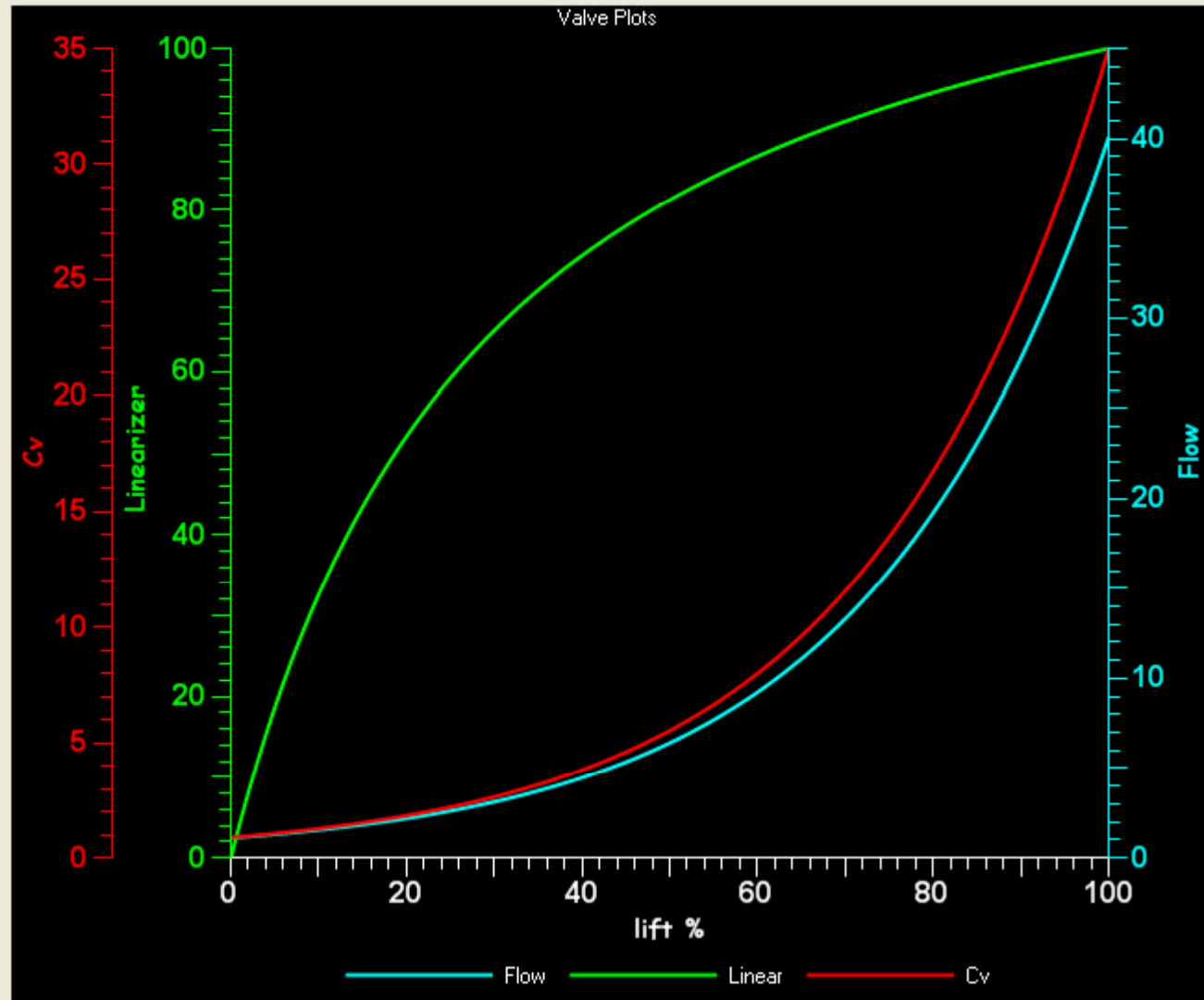
In the Valve Calculation module you can select from a wide variety of valves and determine the expected flow for a given opening or you can use this module to help you size a new control valve.  
  
For 'Equal Percentage Valves' and 'Quick Opening Valves' a

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## Equal Percentage

## Valve Linearizer

X Data	Y Data
0	0
5	4.214
10	8.162
15	11.87
20	15.359
25	18.647
30	21.751
35	24.687
40	27.467
45	30.104
50	32.609
55	34.991
60	37.259
65	39.421
70	41.484
75	43.455
80	45.34
85	47.145
90	48.874
95	50.532
100	52.124



Save

# CTD-TUNE PLANT TUNING SUITE

Known Values

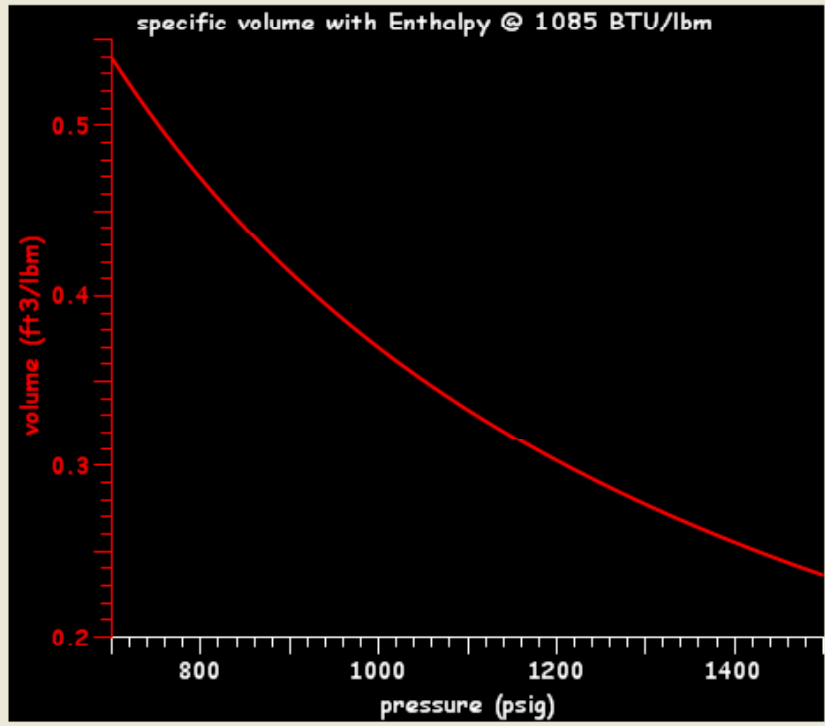
<b>Clear Valves</b>	Pressure <input type="text" value="1100"/> psig	Temperature <input type="text"/> °F	Enthalpy <input type="text" value="1085"/> BTU/lbm	Entropy <input type="text"/> BTU/lbm × °F	Steam Quality <input type="text"/> 1 = 100% STM	<b>Calculate</b>
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Pressure/Enthalpy Data

Temperature <input type="text" value="558.00037"/> °F	Entropy <input type="text" value="1.27608"/> BTU/lbm × °F
Specific Volume <input type="text" value="0.33356"/> ft <sup>3</sup> /lbm	Density <input type="text" value="2.99792"/> lbm/ft <sup>3</sup>
Isobaric Heat <input type="text" value="0.0"/> BTU/lbmF	Isochoric Heat <input type="text" value="0.0"/> BTU/lbmF
Internal Energy <input type="text" value="1016.19429"/> BTU/lbm	Dynamic Visc. <input type="text" value="0.0"/> cP
Sonic Speed <input type="text" value="0.0"/> ft/min	Thermo Cond. <input type="text" value="0.07483"/> W/m K
Vapor Fraction <input type="text" value="0.83612"/>	Vap Vol Frac <input type="text" value="0.98918"/>

Pressure/Enthalpy Graph

Constant:	<input type="text" value="Enthalpy"/>	<input type="text" value="1085"/> BTU/lbm	
Variable:	<input type="text" value="700"/> psig	<input type="text" value="1500"/> psig	<b>Plot</b>



A complete set of Steam Tables are provided along with data plots showing you how the physical properties change over a selected range.

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**New Model**

Project ID:  Loop:  Description:

Process Type:  Test Type:  This Loop was last saved on at

MV Bottom of Scale:  MV E.U.

MV Top of Scale:  %

PV Bottom of Scale:  PV E.U.

PV Top of Scale:  %

**Import File**

**Refit**

Process Gain:

Process Delay:

Process Time Constant:

Process Response:

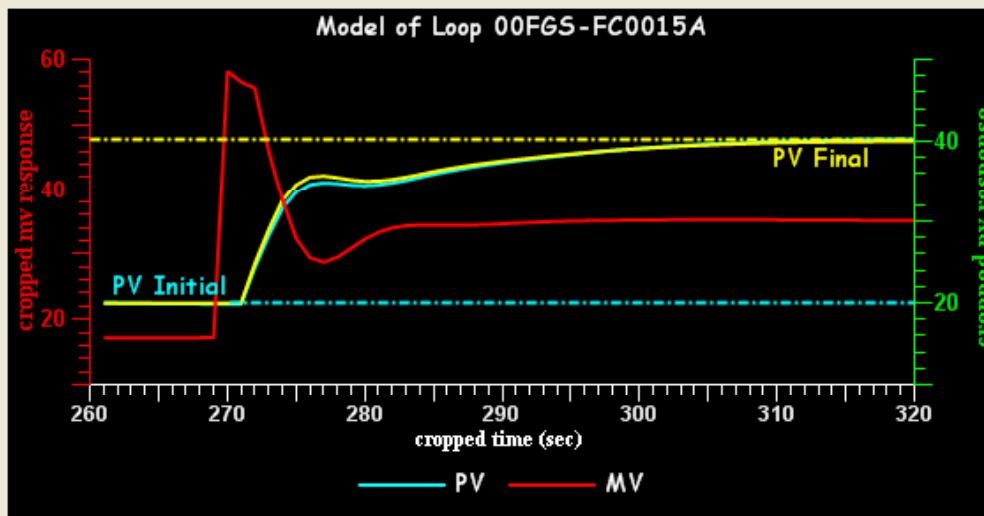
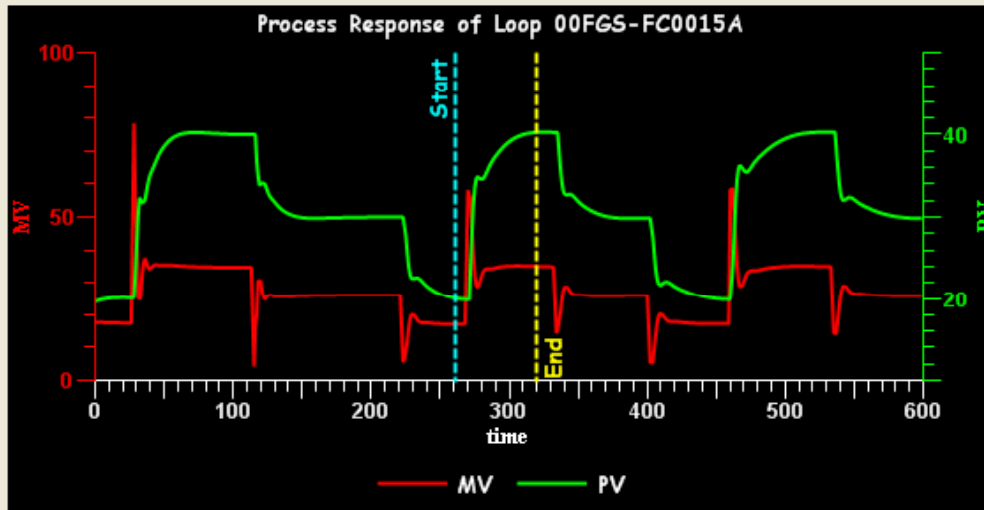
Model SSE:

Model Chi<sup>2</sup>:

Model r<sup>2</sup>:

**Save**

**Print**



Based on the raw text file from your DCS or PLC the Modeling module will analyze your process and determine the mathematical model of you process.

This model is then passed on to the Tuning module.

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# CTD-TUNE PLANT TUNING SUITE

**New Loop**

Project ID:  Loop ID:  Description:

**DCS Vendor**

Type:  Cycle Time:  seconds

**Model Information**

Gain:   
 Delay:   
 Lag:

**As Found Times**

Simulation Time:   
 Load Step Time:   
 Load Step Size:

**Existing Tuning Values**

P =   
 I =   
 D =   
 Df =

**As Found Statistics**

% Overshoot =   
 Margin  IAE =   
 Damping Ratio =   
 Peak Time =   
 Peak Amplitude =   
 Natural Frequency =

**Plot**

**Controller Type**

**Tune**

**New Tuning Values**

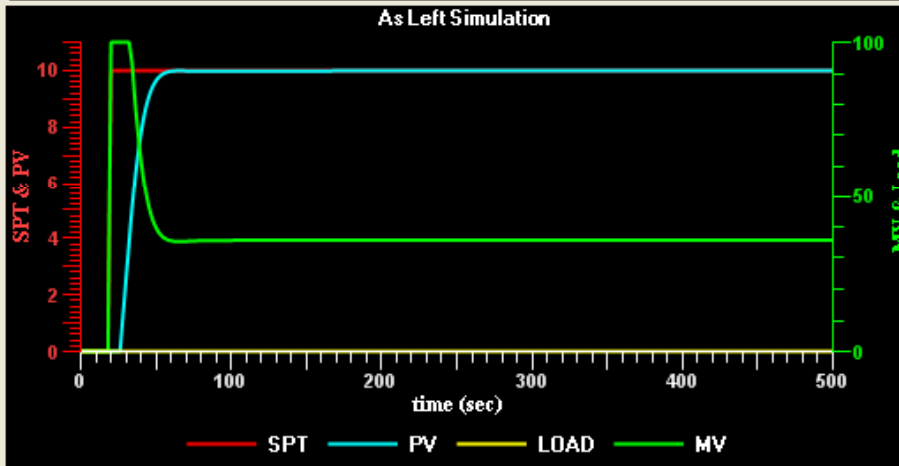
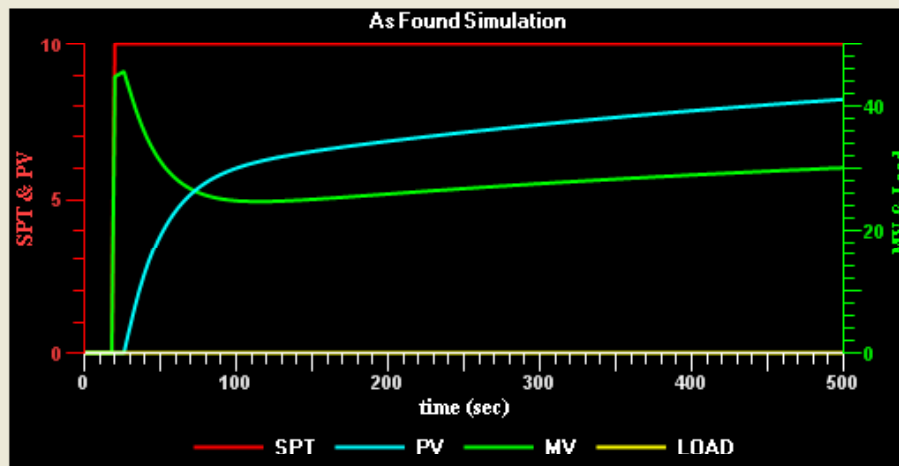
P =   
 I =   
 D =   
 Df =

**As Left Statistics**

% Overshoot =   
 Margin  IAE =   
 Damping Ratio =   
 Peak Time =   
 Peak Amplitude =   
 Natural Frequency =

**Save**

**Print**



The Tuning module will provide you with a graphical representation of your process both before and after the new tuning values are applied.

No math needed here! We use state of the art tuning calculations to help you select the best possible tuning for your process.

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