Practical
TUNING OF INDUSTRIAL CONTROL LOOPS
for Engineers & Technicians

$$F = \frac{F1\ C}{h}(T2-T1)$$
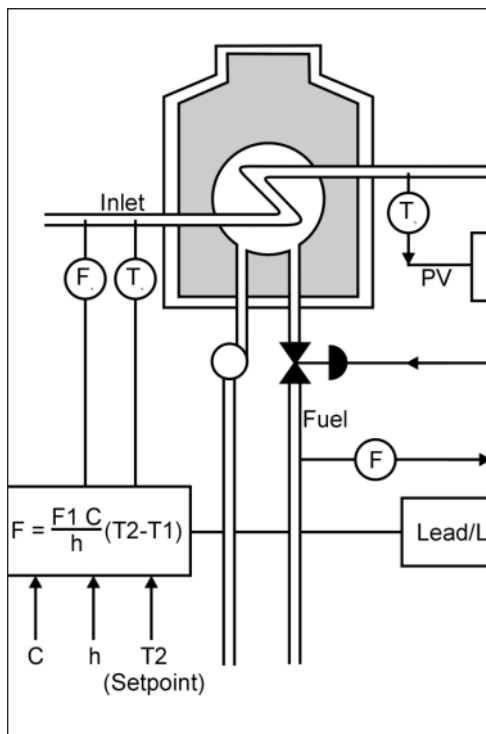
YOU WILL LEARN HOW TO:

- **Tune Loops Effectively**
- **Apply open and closed loop tuning rules effectively**
- **Troubleshoot Tuning problems**

WHO SHOULD ATTEND:

- **Instrumentation and Control Engineers**
- **Process Control Engineers**
- **Mechanical Engineers and Technicians**
- **Systems Integrators**
- **Consultants**
- **Operators monitoring and controlling processes**
- **Installation and Maintenance Technicians**
- **Energy Management Consultants**
- **Electrical Engineers**
- **Electricians**
- **Automation Engineers**

IDC TECHNOLOGIES

Technology Training that Works

THE WORKSHOP

This workshop is designed to train you in the latest procedures for the tuning of Industrial Control Loops using a minimum of mathematics and formulas. Loop Tuning refers to the complex skill of adjusting PID controller parameters so that the control loop performs satisfactorily under all the operational conditions it is expected to cope with. This skill cannot be acquired on merely reading books or manuals, it requires practice and practical experience and this workshop will provide you with the solid fundamentals in this area.

The aim of this workshop is to provide you with the skills required to tune a controller for optimum operation. An optimally tuned processed loop is critical for a wide variety of industries ranging from food processing, chemical manufacturing, oil refineries, pulp and paper mills, mines and steel mills. Although tuning rules are designed to give reasonably tight control, this may not always be the objective. Some thought needs to be given when retuning a loop as to whether the additional effort is justified as there may be other issues which are the cause of the poor control. These issues will be discussed in some detail in the workshop. At the end of this workshop you will have the skills to troubleshoot and tune a wide variety of process loops.

PRE-REQUISITES
Basic instrumentation concepts and some knowledge of instrumentation would be useful.

THE PROGRAM

DAY ONE

FUNDAMENTALS OF TUNING LOOPS
- Processes, controllers and tuning
- PID controllers - P, I and D modes of operation
- Load disturbances and offset
- Speed, stability and robustness
- Gain, dead time and time constants
- Process noise
- Feedback controllers
- How to select feedback controller modes
- *Practical Session*

FUNDAMENTALS OF TUNING
- Open loop characterisation of process dynamics
- Default and typical settings
- General purpose closed loop tuning method
- Quick and easy open loop method
- Fine tuning for different process types
- Simplified lambda tuning
- *Practical Session*

THE DIFFERENT TUNING RULES
- Ten different rules compared
- Tables of typical tuning settings
- When to use them/when not to use them
- 28 rules of thumb in tuning
- *Practical Session*

DAY TWO

TUNING OF VALVES
- Hysteresis
- Stiction
- *Practical Session*

AUTOMATED TUNING
- Self tuning loops
- Adaptive control
- *Practical Session*

TUNING OF MORE COMPLEX SYSTEMS
- Cascade systems - tuning of them
- Feedforward, ratio, multivariable systems
- Interactive loops tuning
- Dead time compensation
- Practical limitations
- *Practical Session*

GOOD PRACTICE
- Good practice for common loop problems
- Flow control loop characteristics
- Level control loop characteristics
- Temperature control loop characteristics
- Pressure control loop characteristics
- Other less common loops
- *Practical Session*

WORKSHOP OBJECTIVES

When you have completed this workshop you will:

- know the fundamentals of tuning loops - both open and closed loop
- get the best PID settings right first time
- know where to troubleshoot to achieve optimally tuned control loops
- be able to apply step-by-step descriptions of the best field-proven tuning procedures
- know the typical procedures for troubleshooting tuning problems
- tune more control loops in less time with consistently excellent results
- be able to apply the practical rules of thumb for tuning systems
- be proficient at tuning with a detailed knowledge of
  - Open Loop Tuning
  - Closed Loop Tuning (including such classics as Ziegler Nichols Tuning and Lambda Tuning)
- be able to determine the minimum settling time for a control loop
- know the optimum amount of filtering or dampening to apply to the measurement
- be able to handle problems such as valve hysteresis, stiction and non linearities
- be able to tune complex loops ranging from cascade to feedforward
- know when to use derivative control for the best tuned loop

PRACTICAL SESSIONS

Throughout the workshop, simulation software is used to simulate real loops and to give you EIGHT real hands-on exercises in a safe practice environment. You will see the simulated process output respond to your input and configuration changes on the loop controller. You will reinforce and apply the concepts learnt using simulation exercises that are close to the real world of the plant.

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> *Instructor extremely well presented, professional and well versed on the subject. Excellent.*
>
> Glen Saunders
>
> ❞

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