# COMBI PID - Preignition Detection

Besides knocking the phenomenon of preignition is the limiting factor in modern otto combustion engines. To detect preignition SMETEC has developed the COMBI PID (PreIgnition Detector). This system measures the ion current via the spark plug and sets it into relation to the ignition point. COMBI PID enables the developer to do without pressure monitoring. This reduces the complexity in continuous operation.

COMBI PID can be used as a one or more cylinder system. In conjunction with the real time indication system COMBI RT a high performance measuring system has been created. COMBI PID measures the ion current and delivers it to the indication system. It measures the ion current and detects PIs cycle by cycle. Due to the large capacity of COMBI RT it is possible to run even the longest measurements. COMBI PID can be used in two different modes with distinct measuring goals.
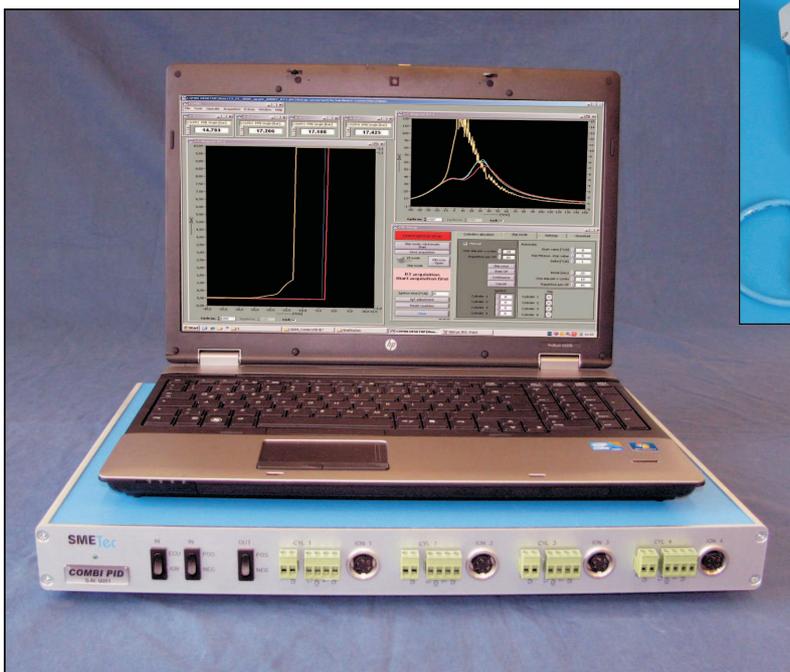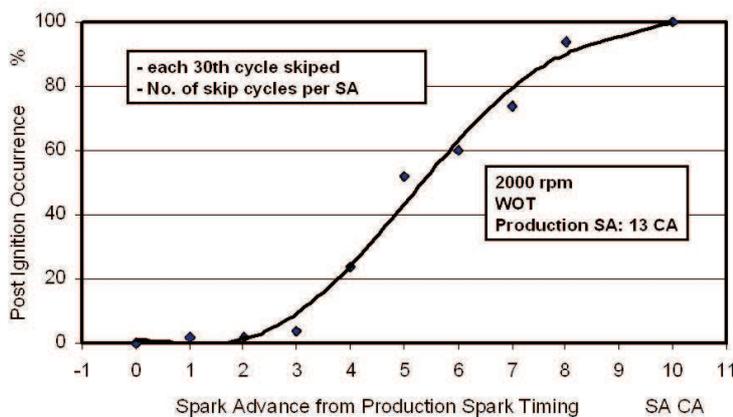

Monitoring Mode

The monitoring mode was designed to detect preignition events during endurance tests at the test bench or during in car investigation. In this mode the system counts every single PI event and stores the result in a file. COMBI PID together with COMBI RT COMBI PID is able to store numerous information concerning preignition for each cylinder and each single combustion cycle up to a very high speed.

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Skip Mode

The skip mode was designed to determine the heat values of spark plugs. In this mode the engine runs in steady state on the test bench. Once ervery 50th cycles for example the ignition is inhibited for one cycle. This test is going to repeat for example 100 times. COMBI PID counts the numbers of preignitions for these skipped cycles and displayed it in a diagram. In the next step the ignition timing changes for a certain step. COMBI PID runs the complete test cycle

- each 30th cycle skiped
- No. of skip cycles per SA

2000 rpm
WOT
Production SA: 13 CA

Post Ignition Occurrence %

Spark Advance from Production Spark Timing   SA CA

again with the new spark timing and depicts the result in a chart.
As a final result the user gets a diagram which shows the sensitivity of the engine concerning preignition. Most of the PI events in skip mode occur after the regular spark timing. In this mode the user finds out how close the engine runs at the PI limit. Due to the high flexibility of the skip mode this mode is used more and more for daily evaluation work.

Applications

- Combustion process development
- Endurance Tests
- Spark plug heat value determination

Delivery

COMBI PID: Power supply and ionisation detector
Adapters: Connectors between spark plug and COMBI PID
COMBI RT: Real time combustion analyser
Software: Comprehensive software bundle for combustion analysis and preignition detection.

Advantages

- Easy to install
- No changes in engine design
- No changes in engine parts
- Protects against expensive engine losses
- Usable in every state of development
- No pressure sensors necessary anymore for PI detection

Properties

- Ion current principle via spark plug
- Extension for 6, 8 or higher number of cylinders
- Software to control the combustion process
- Numereous surveillance strategies and limits
- 2 different applications: monitoring mode and skip mode
- Analysis software on board