Knock Sensor Development

(Ignition Timing Control)

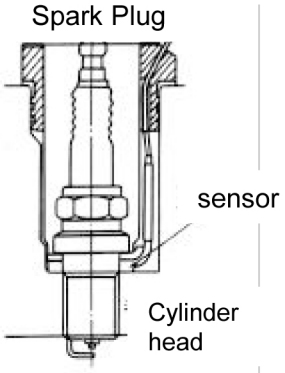
APPLICATION

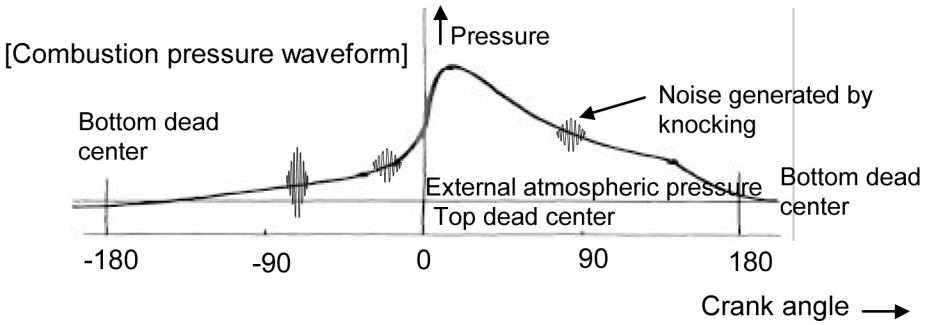
Today's automobiles no longer experience knocking in normal driving due to advanced engine controls. However, engine performance can be improved by utilizing this knocking phenomenon. Knocking occurs when air-fuel mixtures are burned rapidly, either by increasing the compression ratio or engine RPM. That is, at the moment when power increases, knocking is generated. By detecting knocking, the ignition timing can be adjusted to control the engine just below the knocking point. The sensors used for detection of knocking include a vibration type knock sensor and the cylinder's own internal pressure sensor.

SOLUTION

The cylinder's internal pressure sensor detects knocking as a change in combustion pressure. The sensor body is a ring-shaped piezo-electric element mounted to the washer part of the ignition plug (see drawing at top right). The element is subjected to an initial load due to mounting. Combustion pressure is measured as a change in this initial load during engine operation. When knocking occurs, high frequency components are superimposed on the combustion pressure waveform.

These high frequency components and their intensity can be detected, that is, knocking can be detected, by passing them through an appropriate band pass filter. By utilizing this, ignition timing can be controlled for optimal performance.





(This crank angle will be 720 degrees with 4 cycle engine)

DL750 FEATURES

1. An isolated input module with up to 10 MS/s sampling and large memory of up to 1 GW

In order to capture high frequency noise superimposed on low speed signals you must sample at high speeds for long periods. To accomplish this a long record length is required, which the DL750 provides. In other words, fast noise can be captured while observing the entire low-speed signal.

2.User-defined math functions (0ptional)

Low pass, high pass and band pass digital filters can be set using the optional user-defined math function, making the DL750 an ideal analysis tool.

3. External clock input (DL750)

Sampling of the data can be synchronized to engine RPM, thus eliminating many of the noise components found using a fixed sampling rate.