Measuring vibrations on an engine manifold

Optimizing the processes within an internal combustion engine is becoming increasingly important in this day and age. A whole series of measurements is vital for engine management purposes. The temperature of the exhaust gas is one important source and is recorded using a thermocouple within the manifold.

To check the way it is attached, it is necessary to examine the propensity to vibrate, as well as the mechanical rigidity of the structure. This is an application where the blue laser comes to the fore. The high temperatures in the flow of exhaust gas leads to the thermocouple self-fluorescing (becoming red hot).

Due to the short wavelength of the blue-violet laser employed, the light emitted from the thermocouple does not dazzle the sensor, as the long-wavelength intrinsic incandescence is a long way off the 405-nm wavelength of the blue-violet laser, and it is effectively blocked by the high quality interference filters used.

A narrow slit provides the free space needed for the optics. The high ambient temperatures are reduced effectively for test operation by means of a protective plate, while a blower ensures clean optical conditions and the cooling required.

The vibrations expected can be accurately recorded, thanks to the sensor's fast sampling frequency (2.5 kHz) and they can easily be evaluated via an interface to the PC.

Demands on the measuring system:

- Measuring range 20mm
- Accuracy down to 20μm
- Measurement on red-hot objects

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