

Application Note No. 5

Within engineering generally there are many areas where the measurement of forces is difficult and the nether regions of the automotive engine rank fairly high on that list. The combination of temperature, environment and rotating components all conspire against us in a quest for accurate data.

One such requirement was the measurement of oscillatory torque on an oil-pump drive. An additional problem here was the lack of space to fit any transducer or electronics between the drive wheel and camshaft housing.

In this instance the drive wheel had a cavity machined to accept a custom strain-gauged transducer which locked into the drive wheel and accepted the shaft from the oil-pump. (See Fig.1)



Fig. 1 Machined drive wheel and transducer.

The techniques used to transmit the required signal from the rotating to a fixed point have been established by Astech Electronics over 35 years of experience in this measurement field. The transducer output voltage is amplified and then digitised to produce a pulse code modulated (PCM) signal which frequency modulates a carrier wave. This is inductively coupled via loop aerials located on both the rotating and fixed components. Power for the transmitter and transducer is also inductively coupled using the same loop system. A receiver takes the signal from the fixed loop, demodulates and decodes it and presents it as a high-level voltage suitable for storage and analysis.

Inductive coupling was used here but alternatives include infra-red, radio and capacitive coupling. Another possible variance is the frequency of the carrier wave which in this case was 10.7 MHz but could go much higher to allow for a wider data

bandwidth. It is also possible to use battery power on the rotating component but that would limit the operating life of the installation.

Astech Electronics have a wide range of standard modules that go to make up a telemetry system but in their experience there are not many standard applications! As in this case a standard TX31D/1/IFM PCM transmitter had to have its PC layout completely re-configured to fit into the 31mm (dia) x 7mm (ht) space available. In addition to the custom PCB a new aluminium housing had to be machined. (See Fig. 2)

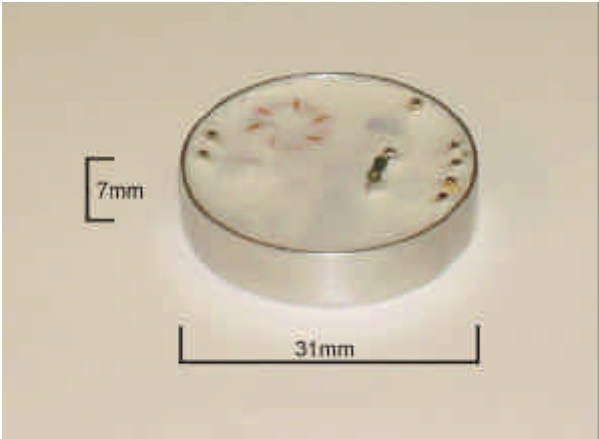


Fig. 2 Custom transmitter and housing.

Loop aerials were bonded to the inner face of the camshaft housing and to the near face of the drive wheel. Figure 3 shows the assembled drive wheel together with the IL2 power and signal pickup unit temporarily positioned for test purposes.

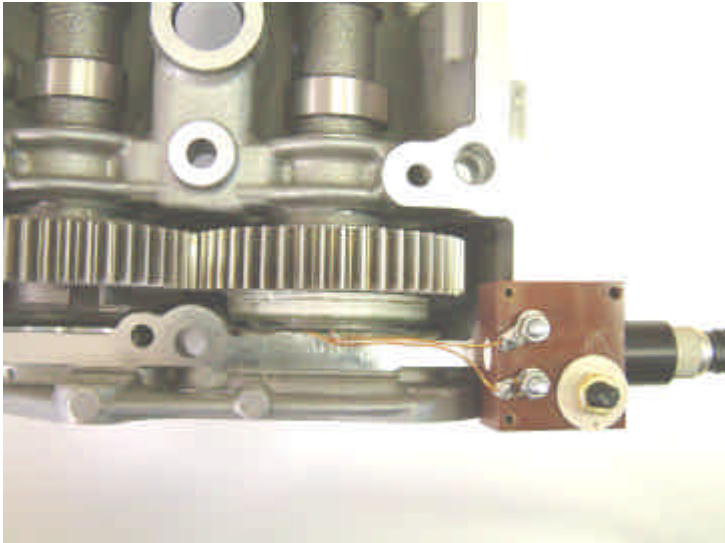


Fig. 3 Assembled components.