

RPM Measurements-“Been There, Done That”

Problem: Verify diesel engine cooling fan speed while driving a bus at 35 miles per hour.
Solution: Install Remote Optical Sensor with 50 foot extension cable and affix a piece of reflective tape to fan clutch hub. Operate “AA” battery powered Phasar Tachometer from driver’s seat.

Problem: Measure a 747 Jet Engine on the Tarmac from 50 feet away in sunlight.
Solution: Panel Tachometer placed in cockpit connected to a Laser Sensor that shoots 50 feet off reflective tape on turbine hub.

Problem: Verify if shaft or pulley is bent while operating at 1800 RPM.
Solution: Adjust flash rate of battery powered Stroboscope to 3600 RPM and view displacement at T.D.C. and B.D.C.

Problem: New design dental drill air turbine speed.
Solution: Panel Tachometer with an Infrared Sensor that measured 525,000 RPM.

Problem: Measure automobile drive axle half shaft speed while driving in Death Valley.
Solution: Install reflective tape on half shaft and mount remote optical sensor on body. Interface 12 volt Tachometer with RS 232 to Data Acquisition System in back seat.

Problem: View helicopter rotor blade lead/lag while in flight.
Solution: Mount Self-Power Sensor on fuselage and reflective tape on rotor shaft to provide 3 TTL input trigger signals to Battery Powered Stroboscope. View blades from copilot seat while flying at sunset.

Problem: Measure diesel engine speed and interface with Data Acquisition System.
Solution: Obtained a TTL Pulse from the Electronic Fuel Injection control module and input into a Panel Tachometer. Then output 4-20 mA and RS 232 information.

These were just some of the applications that Monarch Instrument of Amherst, New Hampshire has been faced with from various customers since 1977. Their American Made Tachometers, Stroboscopes, and Paperless Recorders/Data Acquisition Systems will measure contact and non-contact RPM from fractions of RPM up to 1 Million RPM utilizing uniquely designed Infrared Sensors, Laser Sensors, Remote Optical Sensors, Proximity and Magnetic Sensors.

Monarch invented the Worlds First Internal Rechargeable Battery Stroboscopes in 1990 and the Nova-Strobes today are still the number one selling Stroboscopes in the world. Monarch also invented the worlds brightest and first Continuous Cool Operating Stroboscope in 1990. Previously, other AC Line Powered Stroboscopes could only operate up to a maximum of 20 Minutes before they would shut down due to a thermo switch or they would catch on fire. Nova-Strobe Stroboscopes can operate 24 hours a day, 7 days a week without any fear of shutdown or catching on fire.



The first question to ask when specifying an RPM measuring instrument is “Can you shut the device down and attach a piece of reflective tape?” Many customers are still unaware of Optical Tachometers. They still believe they must use a Strobotach or a Stroboscope to verify the speed of a device. Stroboscopes are typically used, 40% of the time, when the user can not shut the down and attach a piece of reflective tape.

Optical Tachometers are less expensive and easier to use; “simply point and shoot at the reflective target” for an instantaneous RPM measurement. Stroboscope usage takes a little bit of practice due to the phenomenon called “harmonics” where you can stop the motion or freeze the action on more than one speed. Correct operation of a Stroboscope is to start at a higher RPM (flash rate) and slowly decrease the flash rate until you see a single image of the bolt head, scratch or key way on the shaft you are trying to measure. Once this reference mark is visually stopped, then divide that RPM by 2 and once again you should still see the exact single reference mark. The converse is once you have stopped the motion of the device and see the reference mark bolt head or key way at the actual speed, then when you double that RPM reading you will see two bolt heads or two key ways 180 degrees out of phase with each other. This indicates you are blinking the Strobe twice as fast as the objects actual speed and that is why you see two objects.

Stroboscopes are also ideally suited as inspection lights to check for bent shafts, bent pulleys, slipping belts on pulleys, loose nuts and bolts on couplings, quantity of grease remaining on gear teeth and chipped gear teeth. To check for a bent shaft or pulley on a motor simply operate the Stroboscope at a speed 2 times the actual RPM then view object from the side. Bent shafts or bent pulleys will appear as a wobbling device moving back and forth at T.D.C. and B.D.C. You can see the actual displacement of the misalignment.

In summary, when it comes to measuring RPM you must first determine if you require a Stroboscope or a Tachometer. In addition to verifying speed with a Stroboscope, you may perform stop motion studies or phase shift analyses on rotating devices? When it comes to choosing a Tachometer, a hand held portable contact or non-contact or a panel mount instrument must be selected. The most popular Sensor is a Remote Optical Sensor where the operator simply installs a piece of reflective tape and aims the hand held portable Tachometer or Remote Optical Sensor from a safe operating distance of up to 36 inches away. Laser Sensors can be used to shoot up to 50 feet with or without reflective tape. There is no such thing as an impossible RPM measurement, some are just a little harder to achieve with the appropriate Sensor and Tachometer/Stroboscope combination. Many companies are taking the ISO 9000 path and require documented N.I.S.T. Calibration Certificates for all speed (RPM) rated equipment. Remember, you can not have correct C.F.M., G.P.M., H.P., or idle speed without correct RPM measurements.