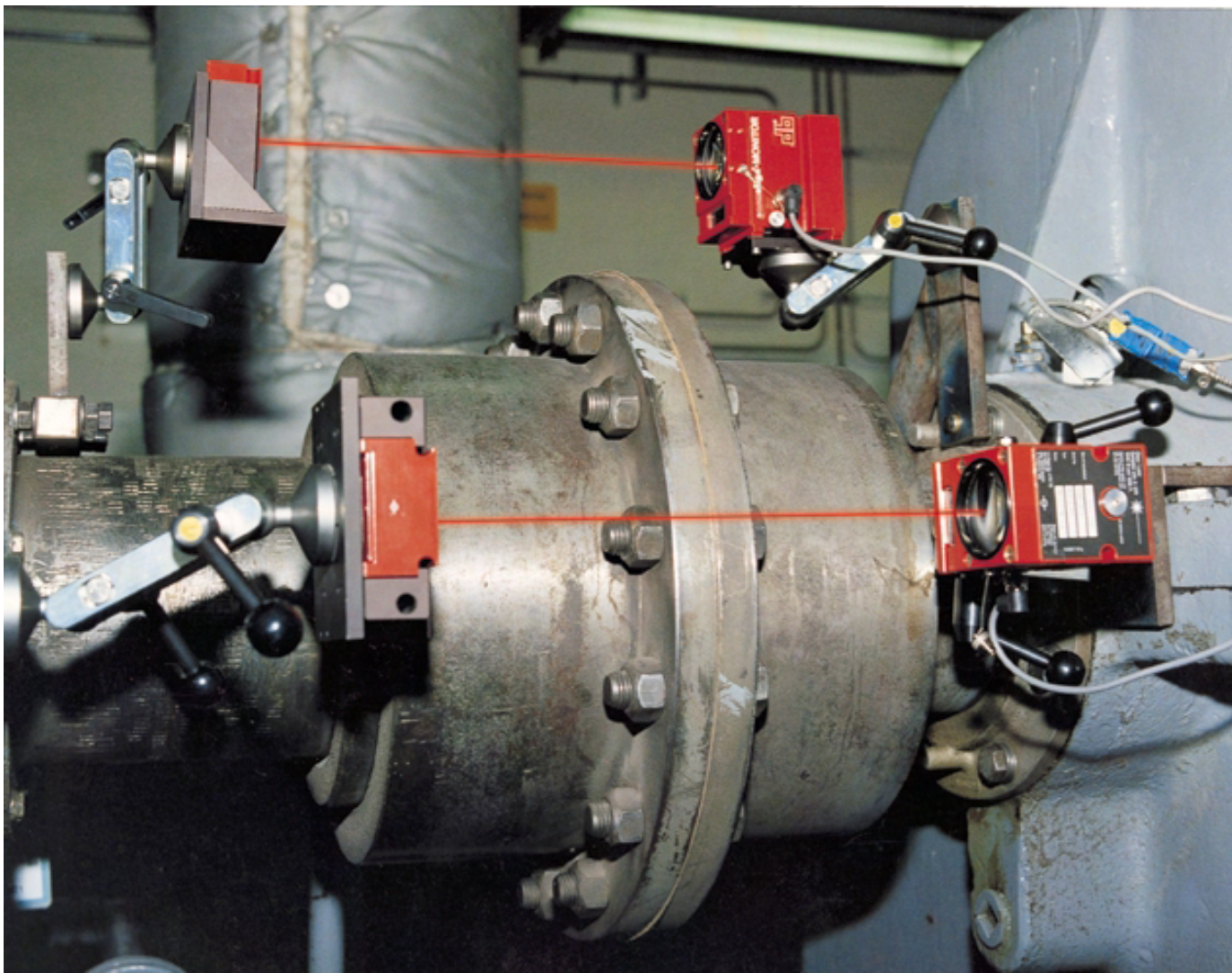
PERMALIGN®

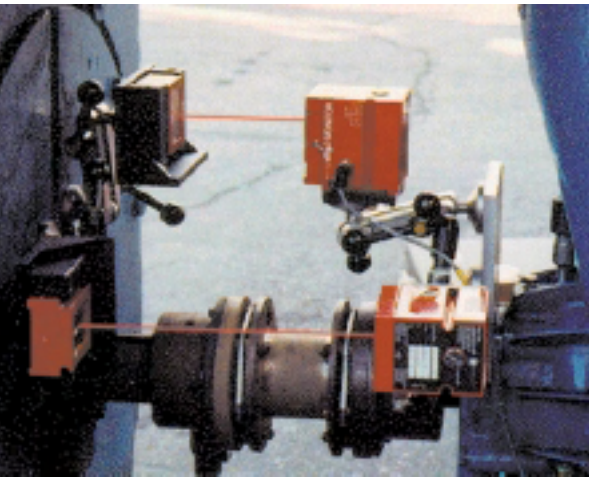
Monitoring of Alignment Changes

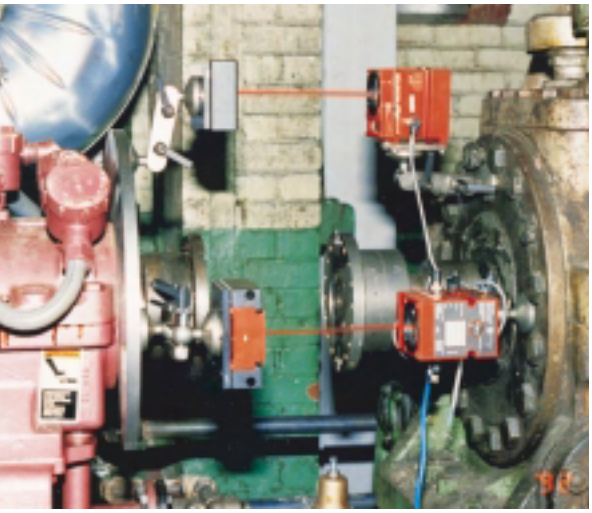
Cold to hot, hot to cold or running under varying load conditions

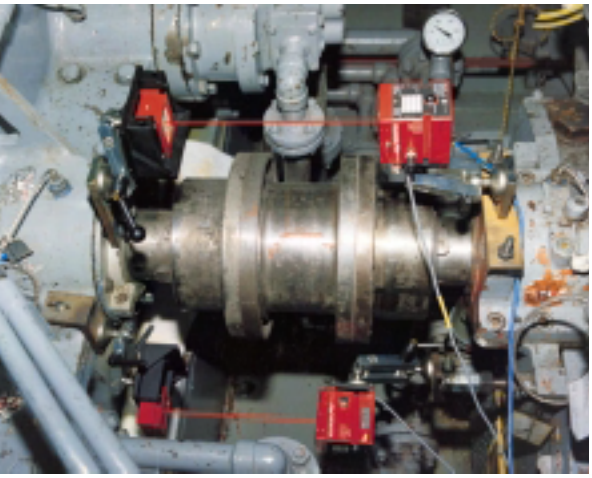


Alignment Monitoring

Permanent or temporary monitoring of machinery alignment changes due to thermal growth, pipe strain, operating loads and foundation settling, both relative and absolute.







The PERMALIGN® laser system measures and monitors alignment changes, commonly referred to as "Thermal Growth", of rotating machinery during operation. It can measure the absolute move of a machine or the relative move between coupled machines. It may be used for permanent monitoring or for just the necessary time to determine positional change from cold to hot or vice versa. The user may obtain printout of numerical data, graphics and plot curves of positional changes. Contrasting with other monitoring methods, PERMALIGN® allows you to determine what movements have thermal origin and what movements are caused by dynamic influences, pipe strain or load variations, etc. thus enabling the user to not only measure but also analyze the causes of the measured movement. PERMALIGN® is the only linearized laser measuring system with a resolution of one micron throughout the entire detector range of 0.630". The system permits measurement at distances of up to 30 ft. Temperature variations and vibration do not affect accuracy.

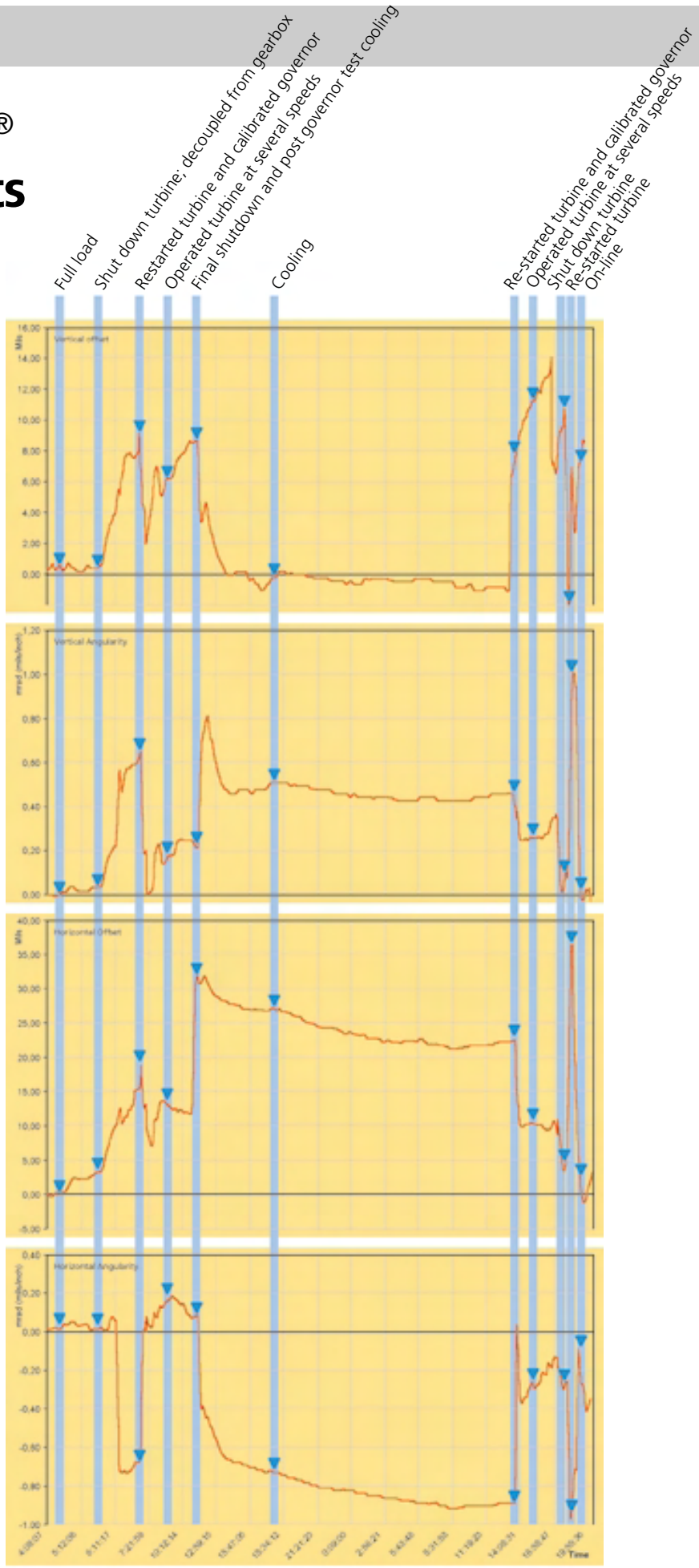
Photo 2: Laser and reflectors are set up to monitor alignment of steam turbine air compressor. The coupling, which had been removed for speed trip test, was re-installed before alignment monitoring test.

PERMALIGN® Monitor

Typical PERMALIGN® measurement results

Example:
A gearbox driven by a single stage turbine exhibited reliability problems for over 15 years. Periodically, the gearbox would fail. Repair costs typically ranged from US$100,000 to 200,000. It was decided to monitor each coupling with PERMALIGN® to ascertain positional changes between the turbine, gearbox, and fan. Positional changes between the fan and gearbox did not exceed tolerances. However, large changes were discovered between the turbine and gearbox, particularly in the horizontal direction. These changes were attributed to piping configurations and process parameters. PERMALIGN® measured data let to a permanent solution; the customer installed expansion joints. The unit has operated problem-free since.

The measurement values can then be entered directly as target specifications during subsequent OPTALIGN® or ROTALIGN® laser shaft alignment.



Vertical Offset
Positive vertical offset indicates turbine shaft centerline at coupling center is shifted to 12:00 relative to gearbox shaft centerline

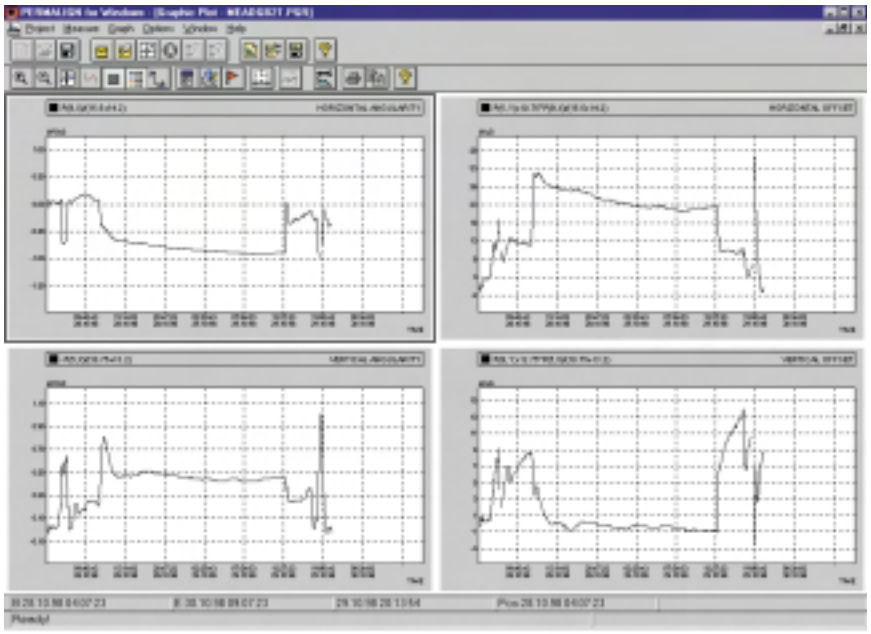
Vertical Angularity
Positive vertical angle denotes open to top of the coupling

Horizontal Offset
Positive horizontal offset indicates turbine shaft centerline at coupling center is shifted to 3:00 relative to gearbox shaft centerline.

Horizontal Angularity
Negative horizontal angularity denotes coupling open to 9:00.

Collecting data with PERMALIGN®

The WINPERMA® PC software collects, stores and plots the data from the PERMALIGN® monitoring system. The data from the monitors can be collected every few seconds, minutes or hours. WinPerma also lets the user set the length of time that data collection will occur. The data collected and stored can then be displayed, printed or used to generate trending reports. Data from multiple monitors can be collected with a single serial port and several graphs can be trended simultaneously. Graphs can be displayed as the data is being collected or anytime thereafter. Events can be recorded during data collection for later analysis.



PERMALIGN® technical data

Resolution	1 µm
Accuracy	better than 2%
Measurement range	5/8" x 5/8", (16 x 16 mm) 2 displacement axes
Max. separation	30 ft. (10 m)
PC Interface	RS 232
Laser safety class	Class 1 (no protection necessary)
Protection from operating environment	IP65: dust- and spray-proof
Intrinsic safety (optional)	Fulfills Zone 1 requirements EEx ib IIc T4 Zone 1
Operating temperature range	50° - 122°F (10° - 50°C)
(w/o external cooling/heating)	32° - 158°F (0° - 70°C)
Monitor:	
Dimensions (W x H x D)	2 9/16" x 3 9/16" x 3 9/16" (65 x 90 x 90 mm)
Weight	approx. 1 3/4 lb. (750 g)
90° Roof prism:	
Dimensions (W x H x D)	2 9/16" x 2 3/4" x 1 9/16" (65 x 70 x 40 mm)
Weight	approx. 5/8 lb. (280 g)

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сайт: www.pruftechnik.nt-rt.ru || эл. почта: pkh@nt-rt.ru