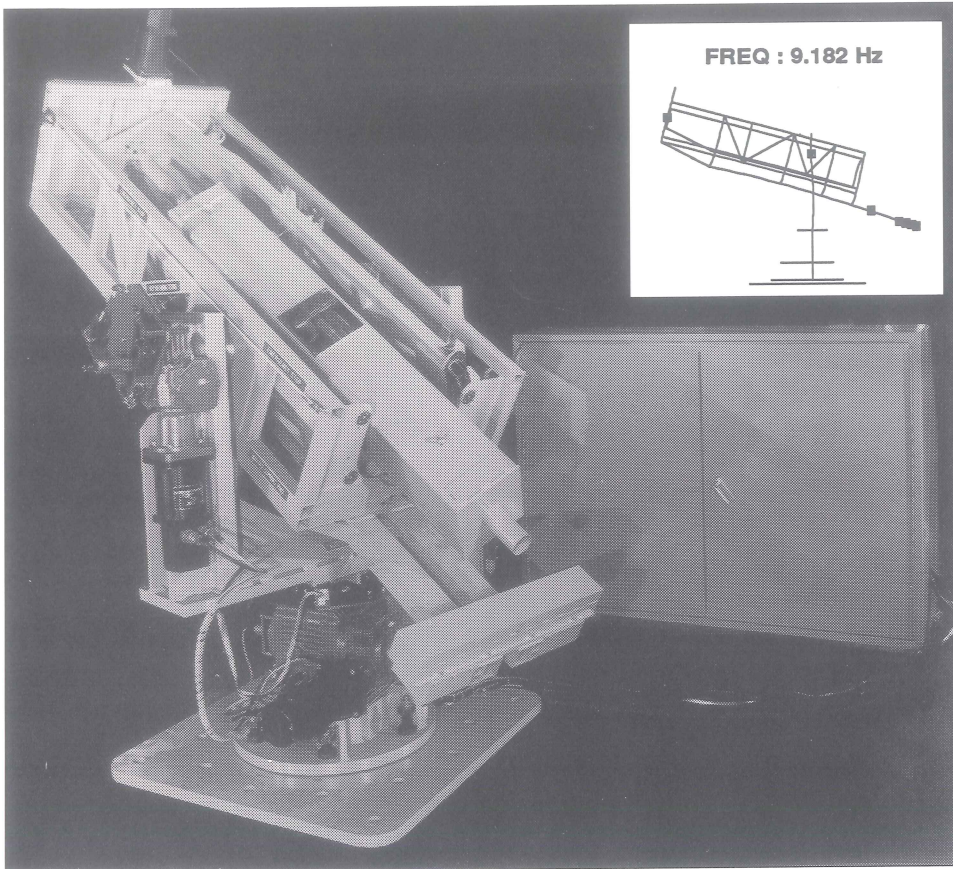


ANCONEWS

SYSTEMS, TRANSDUCERS, & STRUCTURES



The Tacit Rainbow test fixture is typical of electromechanical test systems designed and manufactured by ANCO. The fixture uses servo technology integrated with analog and digital instrumentation and data processing.

ANCO Delivers Computer Driven Missile Test Fixture

Recently ANCO delivered to NORTHROP CORPORATION a pair of fixtures for assembly line testing of Tacit Rainbow Cruise missiles. These fixtures, which are designed and built to exacting requirements specified by the customer, perform simulated flight maneuvers on the missile under computer control. While the three axes are in motion, velocity and attitude measurements are captured by a host test computer from instruments on the fixture and the rate gyros in the missile.

Digital Servo Controllers

Fixture axes are actuated and controlled by a computer-based closed loop digital servo system. It is programmed to accelerate the missile to a commanded test velocity within 5 degrees of axis travel and then traverse the axis at that velocity, within close limits, during data acquisition. The axis is then decelerated to stop at a previously specified position.

Structural Analysis of 3D Frame

Significant inertial forces are generated

in these maneuvers, and consequently, torsional stiffness and structural rigidity were major considerations. Restrictions on the use of ferrous metals in close proximity to the missile necessitated the majority of the structural members being fabricated from aluminum. Missile access requirements and space limitations imposed other constraints on the structural configuration. To hold static deflection and dynamic oscillation within allowable limits under the most severe loading, ANCO performed extensive finite element analysis as part of the design task.

Redundant Position Resolvers

Each axis is equipped with dual resolvers one of which serves two purposes: 1) It provides position feedback signals to the servo system, and 2) it provides axis position to the customer's test computer. The second resolver provides a duplicate axis position signal to the test computer. By comparing the signals from this pair of instruments, the accuracy of axis movement can be verified during each movement and also during self-test routines.

Software Development

ANCO developed application software for fixture control. These programs allow the fixture to respond to commands and report position and velocity data to a Hewlett Packard host computer that is part of the client's test facility. For testing purposes ANCO developed additional software that permitted a PC to emulate the host.

The software includes program modules that provide the system with diagnostic capability. Selftesting of the axis measuring instrumentation and axis control system is automatic on power up and can be performed at any time on command.

Safe Operation Assured

Operator and equipment safety were mandatory requirements imposed by the specifications. These were given major emphasis during the design process and were the subject of extensive collaboration between the customer and ANCO design staff.

For more information, contact John Gray of ANCO Engineers, Los Angeles

Rotating Shaft Monitoring on Nuclear Reactor Recirculation Pumps

Torsional strain in vertical recirculating pump shafts at the **Peachbottom Nuclear Power Station** was of interest in determining the source of shaft cracking. Philadelphia Electric Co. asked ANCO to install torsional strain gages and telemetry instrumentation in order to monitor strain amplitude and frequencies during normal operations. ANCO's system, now in successful operation for over two years, has allowed verification of analytical models and provided data for fatigue life prediction and maintenance.

FM Transmitter Eliminates Slip Rings

Rotating equipment and shafts are found throughout power plants. Often there is a need to measure stress or other parameters at some critical point on the shaft or attached rotating component. In the past noisy and unreliable slip rings were used to transfer the signals from the rotating member to a recorder (and to power the transducer). More recently, small shaft-mounted FM transmitters with integrated signal conditioning, and induction power units have been developed that greatly improve the state of the art.

ANCO has experience with a number of telemetry systems and is an authorized installer of the Wireless Data Systems (formerly Acurex) equipment line. ANCO finds the WDS line to be the most accurate and reliable available today.

Many System Parameters can be Measured

While stress is the most often measured parameter, torsion, bending, axial load, power transfer, pressure, acceleration, and vibration can also be monitored.

Using such systems, plant personnel can monitor the health and performance of critical rotating components. A predictive and preventative maintenance program can be formulated to include: **Shaft crack detection**, monitoring of **fatigue life, alignment, and power output**, accurate measurement of **loads in gear teeth and bearings**, as well as, **instabilities in (rotor) hydrodynamics and (turbine-generator) torsional vibrations**.

For more information, contact Tom Solimeo of ANCO Engineers, Los Angeles

SONGS Shutdown Averted with 24 hour Seismic Test

In October 1991 the NRC notified Southern California Edison (SCE), that due to past procedural issues, a rack mounted Foxboro Nest Conditioner (FNC) was no longer considered to be seismically qualified. Such nests are used to condition pressure, temperature, and flow transmitters. At the San Onofre Nuclear Generating Station (SONGS) hundreds of safety related control and instrumentation channels were affected. If the seismic capability of the FNC could not be reestablished, SONGS faced mandatory shutdown in a few days.

2 Week Test Performed in a Weekend

SCE contacted ANCO on Friday, 18 October. "Could seismic shake table tests be performed to avoid a shutdown on Monday, 21 October?" Kelly Merz, ANCO Principal Engineer, knew that such testing is normally planned and conducted over a 10-20 day period. "Responding to client emer-

gency needs," noted Merz, "is in the ANCO spirit. In fact it seems we do our best work at odd hours!" While SCE prepared a FNC for testing, ANCO prepared its R-5 independent triaxial table with an appropriate rack and tuned the table to the test response spectra. The FNC arrived at 11 PM Friday. Testing began by 4 AM Saturday.

Seismic Capacity Confirmed

Working closely with SCE engineers, ANCO completed all testing by 5 PM Saturday. The tests, conducted under 10CFR21 and IEEE 344 guidelines, included chatter monitoring and functionality checks. The FNC passed the severe SCE seismic requirements. "The test was speeded up by the close cooperation of the SCE instrumentation group and the ability of our triaxial table to meet IEEE 344 without the need to rotate the equipment several times, as is required on biaxial tables," indicated Merz,

ANCO Celebrates 20 Years of Service

1971 Established as an Engineering Consulting Firm: Testing, Analysis, Research in Seismic, Structural, Computational and Nuclear Disciplines.

1974 First International Clients: Federal Republic of Germany, USSR.

1975 First Major Energy Study: "Efficient Energy Use", Pergamon Press, (for the Electric Power Research Institute).

1977-82 Expansion of Client Base: Electric Utilities, Oil Production and Transport Firms, National Science Foundation, NASA, US Army Aviation, US Army Medical, US DOE.

1977-85 Fundamental Study on Seismic Dynamics of Cable Trays: In conjunction with Bechtel, performed studies on over 500 configurations to establish new design guidelines to greatly reduce design and installation costs.

1980-85 International Client Base Expands: France, Yugoslavia, Sweden, Norway, Egypt, Japan, Brazil, Great Britain.

1984-87 First Series of Technology Patents: Developed nuclear steam generator cleaning systems subsequently licensed to Westinghouse and the US Navy.

1986 Establishment of New York Office: Serves Consolidated Edison with the "Apple Power" and "Enlightened Energy" Demand Side Management Programs.

1987 Establishment of Milwaukee Office: Serves Wisconsin Electric in Demand Side Management via the "Smart Money" program.

1989-91 Design of Special Aerospace Systems: Inertial Navigation Testing Systems for Cruise Missiles, Computerized Torquing for the Space Shuttle, and Tether Monitoring for Satellites.

"as well as a lot of hard work by all."

Commendation

James T. Reilly, SCE Manager of Nuclear Engineering and Construction, subsequently wrote "SCE thanks ANCO for the outstanding effort performed. ANCO was requested, on very short notice, to perform seismic testing on items critical to the operation of San Onofre. Edison particularly wants to acknowledge the efforts of ANCO personnel including Kelly Merz, John Stoessel, Tom Solimeo, Phil Martinez, and Paul Ibanez. This commitment is greatly appreciated."

ANCO's staff of more than 120 now work out of offices in Los Angeles, Milwaukee, and New York to meet our client needs.

Los Angeles:

ANCO Engineers, Inc.
9937 Jefferson Blvd., Suite 200
Culver City, CA 90232-3591

Tel: (310) 204-5050 Fax: (310) 202-6085

Milwaukee:

The ANCO Consulting Group
161 W. Wisconsin, Suite 3038
Milwaukee, WI 53203

Tel: (414) 289-9922, Fax: (414) 289-0455

New York:

ANCO Engineers, Inc.
6 W. 32nd St., Suite 1203
New York, NY 10001

Tel: (212) 643-7275, Fax: (212) 643-7110