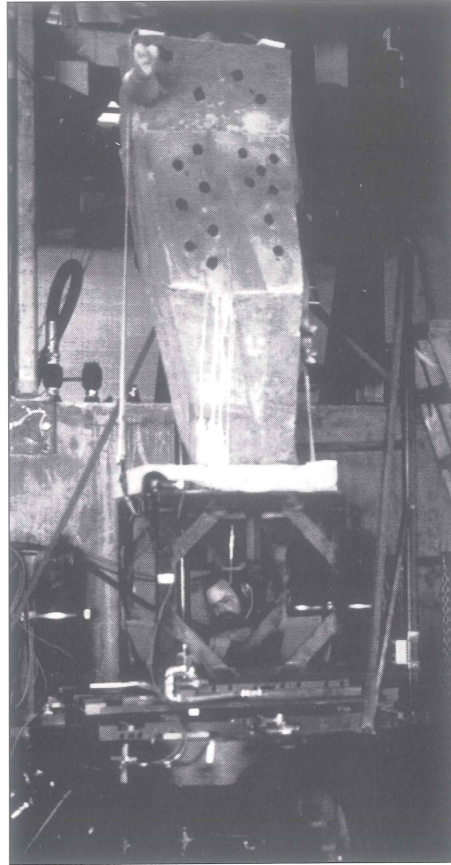


# ANCONEWS

## SYSTEMS, TRANSDUCERS, & STRUCTURES



*Fifth-Century BC "Aphrodite" is now believed to be earthquake-safe.*



*A concrete model substitutes for "Aphrodite" in isolator and shake-table tests at ANCO Engineers in Culver City.*

## Getty's "Aphrodite" Mounted on ANCO-Tested Seismic Isolation System

*After a year of restoration and engineering against earthquakes, the \$20-million Greek statue is back on view.*

The J. Paul Getty Museum's spectacular "Aphrodite" sculpture is back on view in the museum's South Italian gallery.

The limestone and marble figure, thought to represent the Greek goddess of love, is the work of an unknown artist working in Magna Grecia, the Greek colonies that flourished in Southern Italy and Sicily from the 8th to the 4th Century BC. The Getty purchased the spectacular piece, valued at \$20 million, in 1988.

The figure arrived at the Getty with the bulk of its limestone body in three pieces, an unattached marble arm, foot, head, and assorted fragments. The figure was temporarily assembled for the introductory show.

### Hidden Seismic Isolator

After the introductory show, the figure underwent a painstaking restoration process which included a careful cleaning, removal of rough encrustations from the body, replacement of the detached arm and

foot, filling of the two massive cracks and various smaller fissures, and assembly of the figure with an integrated seismic isolation base.

Visitors encountering "Aphrodite" come face to face with the only cult figure of the period to survive nearly intact from head to foot. What they do not see is that the museum's largest and heaviest sculpture—measuring 7-1/2 feet in height and weighing nearly 1,000 pounds—stands on a metal isolator hidden in a massive pedestal. A tensioned cable running through the center of the figure attaches the sculpture to the 1,000-pound isolator designed to allow the sculpture to glide through a major earthquake.

The isolator was designed and constructed at the Getty by Wayne Haak, a conservation technician and mount maker.

The layered planes of the isolator are designed to roll on tracks to avoid transfer of horizontal movement, during a quake.

### Confirming 3D Tests

The design goals were confirmed during testing at the seismic laboratories of ANCO Engineers. Working with engineers from Lindvall, Richter and Associates, ANCO conceived and implemented a test plan. A concrete model roughly approximating the sculpture's weight, mass, and form was attached to the isolator, then both were attached to ANCO's R-5 triaxial shake table. Both isolator and model were subjected to computer controlled excitations comparable to a nearby quake measuring from 6 to 8 points on the Richter scale. Videotapes of the tests show that the model barely shifted while the isolator and table shook convulsively. ANCO has run similar tests over the last several years for the Getty on less sophisticated isolators, most notably an isolation base for the archaic Greek "Kouros" sculpture, and for display cabinets for a series of Etruscan terra cotta plates. In addition, ANCO's seismic lab assisted in a series of experiments to observe the response of antiquities displayed in a variety of weighted pedestals in a non-isolated environment.

*For more information, contact  
Dr. Paul Ibanez  
at ANCO Engineers, Los Angeles*



# ANCO "Builds" 500 mWe Powerplant

Since 1986 ANCO has designed and implemented several energy conservation programs for major electric utilities. The reductions in power load achieved by these programs total nearly 500 mWe. This is the equivalent of deferring the construction of one new advanced design nuclear power plant.

These programs promote conservation on the customer's side of the meter. For this reason, they are referred to as *Demand Side Management (DSM)*. The underlying concept is that it is more cost effective for a utility to provide financial incentives (in the form of rebates and equipment subsidies) to its customers to avoid

adding a KW of demand than to build the new capacity to generate it.

## ANCO's Multi-Utility Programs

ANCO is in the sixth year of implementing the two largest DSM programs in the U.S., Consolidated Edison of New York's "*Enlightened Energy*" and Wisconsin Electric's "*Smart Money*" programs. ANCO worked with each utility to design the DSM programs and directs nearly 100 professional staff, who work with utility engineers to implement the programs.

To further illuminate the DSM issue, ANCONews recently interviewed **Dr. George E. Howard**, ANCO Chairman, **Joe Conlon**,

ANCO Project Manager for the Consolidated Edison of New York program, and **Dr. W.G. (Biff) Bentley**, President of The ANCO Consulting Group, and director of the Wisconsin Electric program. We asked them to comment on DSM, its benefits, and its future.

Dr. Bentley observed that, "DSM has captured the attention of many utilities in the U.S. and worldwide. The potential for avoiding, or at least delaying the expense and (let's face it) travail of building a new plant is compelling because this is not a Zero Sum Game. Everyone benefits from a well designed and managed DSM program. The customer saves energy and, thanks to the utility's incentive payment, realizes a prompt payback on his investment in new equipment. The utility avoids the cost of a new plant. And, finally, the community gains because fewer resources are expended, and environmental pollution is reduced."

"In the future, expect increased activity in the following areas: encouragement by regulatory bodies, interest and understanding by customers, creative actions by manufacturers and distributors, and further adoption of DSM by foreign entities. This is an activity that will persist for much of the next decade."

Joe Conlon adds, "The breadth of technologies involved is impressive. These include hot and cold thermal energy storage, solid-state lighting ballasts, variable speed drives, anticipatory HVAC systems, industrial process modification, peak shifting, controlled use of natural lighting, as well as high efficiency lights, motors, HVAC, insulation, and window treatments."

## Efforts Expanding to Michigan

Dr. Howard announced that "ANCO was recently selected by Consumer Power of Jackson, Michigan, to conduct its commercial/industrial DSM program. The program requires an 18-month DSM effort with goals to reduce demand by 170 gWh over the life of the DSM improvements. We are now launching an 85 man-year effort in Michigan to assure that program goals are met. There are monetary incentives for meeting these goals, and penalties if the goals are not met, imposed by the Public Utilities Commission on Consumers Power, with ANCO sharing in the program risks and rewards. The ANCO/Consumers Power team is intent on meeting these goals."

So ANCO will soon "complete" its second 500 mWe DSM power plant.

*For more information, contact  
Dr. George E. Howard, Los Angeles  
or  
Dr. W.G. Bentley, Milwaukee*

## ANCO Research in Thin Film Transducers Has Application in Prosthetic Design

Highly polar poly-vinylidene (PVDF) or "piezofilm" is a polymeric material with unusual properties. With the proper manufacturing techniques this material can exhibit both piezo- and pyro-electric effects. Because of its thinness (as thin as .0003 inch), large dynamic range, and durability, PVDF is now frequently used in sensor design. Because of this remarkable product, sensors that were once thought to be impossible are now being used to measure force, pressure, temperature, and acceleration.

Research into applications for thin film transducers recently led ANCO's John Stoessel to the offices of prosthetists Jan Stokosa, of Lansing, Michigan, and Anthony Layton, of Lawton, Oklahoma, where he conducted successful field tests on the use of the material to accurately measure and record the pressure placed on various areas of the limb in the fitting of prosthetic devices.

### Fitting is a Complex Process

The construction of a prosthetic socket is a highly complex process that involves a great deal of subjectivity and a series of castings and recastings, until a socket with a near-perfect fit is achieved. The goal is to build a socket which creates an equal pressure on all surfaces of the amputated limb -- something that is currently achievable only through trial and error, according to Layton.

### Accurate Pressure Measurement Offers Many Benefits

By being able to accurately measure the pressure placed on the amputee, a prosthetist could fit an amputee with greater precision, reduce the number of test sockets used in a fitting, and extend the life of an artificial limb.

A minimum of three test sockets are pres-

ently used to fit each amputee. If that number could be reduced by just one socket, the savings to the customer would be at least \$1,500.

Currently, most prostheses must be replaced every two to five years, due to changes in fit, function and appearance. Because an amputee must bear weight on an unnatural weight-bearing portion of the body, limbs change. Muscles that are no longer needed atrophy, others which are used more than ever increase in bulk, and fatty tissue progressively deteriorates.

By incorporating the pressure transducer into the prosthesis, changes in pressure over time can be monitored as the prosthesis is being worn. Corrective adjustments can then be more efficiently made to the socket thus extending the prosthesis useful life and delaying its replacement.

### Missing Link in CAD-CAM

"ANCO's pressure transducer could also prove to be a vital link in the computer-aided design system currently in use by prosthetists throughout the United States and the United Kingdom," added Layton.

The computer gives prosthetists better communications, information storage and retrieval, and dimension manipulation, but not yet the ability to manufacture a socket with a better fit.

"The link that is missing is the pressure transducer to make the fit. If we had a numeric representation of the pressure exerted on the inside of the socket, we could store that information and relay it to a manufacturer. Then we'd have the whole ball of wax," Layton said.

*For more information, contact  
John Stoessel  
at ANCO Engineers, Los Angeles*

### 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, Inc.  
161 W. Wisconsin, Suite 3038  
Milwaukee, WI 53203

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

### New York:

ANCO Engineers, Inc.  
6 West 32nd St., Suite 1200  
New York, NY 10001

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