



UNITED STATES
DEPARTMENT OF ENERGY

GEOHERMAL TEST FACILITY

A GEOHERMAL ENERGY PROJECT OF
THE U.S. DEPARTMENT OF ENERGY

WESTEC Services, Inc.



San Diego, California
Tustin, California
Brawley, California
Las Vegas, Nevada
Fort Washington, Pennsylvania
Albuquerque, New Mexico

GEO THERMAL TEST WELLS EAST MESA TEST SITE

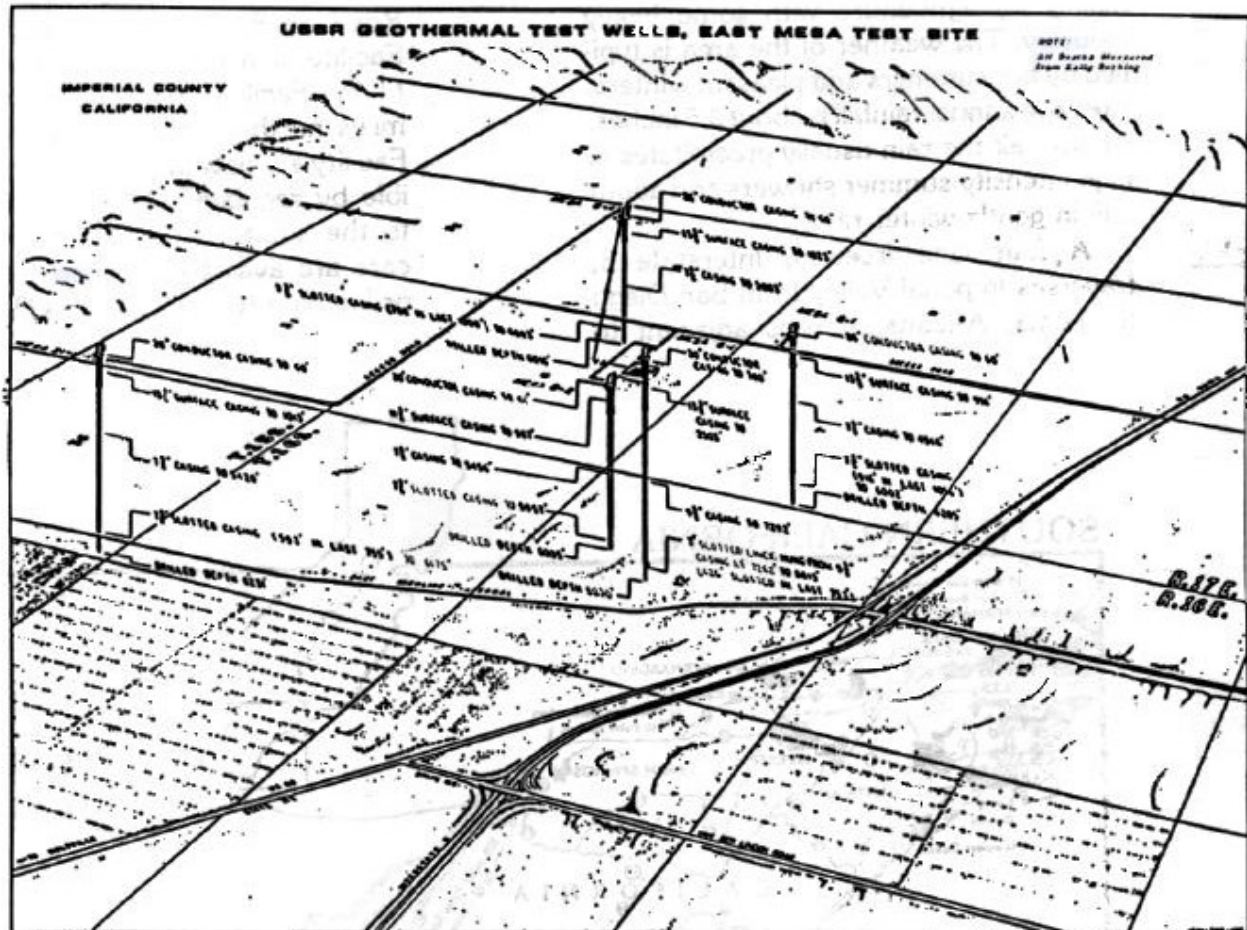


Figure 1. Phantom View of East Mesa Test Site
(Courtesy of Bureau of Reclamation)

LOCATION

The East Mesa GTF is located about 20 miles east of El Centro, about 140 miles east of San Diego, and 10 miles north of the Mexican border in the Imperial Valley of California. Its location is pinpointed on Figure 2, below.

The Imperial Valley is supported mainly by agriculture with some heavy industry. The weather of the area is typified by hot summers and pleasant winters. Average annual rainfall is about 3.5 inches. About half the rain usually precipitates in high intensity summer showers and about half in gentle winter rains.

A four lane freeway, Interstate 8, traverses Imperial Valley from San Diego to Yuma, Arizona. It runs adjacent to

El Centro and about 2 miles from the GTF. To the north, State Highway 111 connects El Centro to Indio and Palm Springs. The Van Der Linden Road exit from Interstate 8 provides access to Even Hewes Road which parallels the freeway on the north side. East of Van Der Linden Road on Even Hewes Road is the Test Facility sign located by the access road to the Facility; the Facility is located 1.7 miles north of this sign. All roads to the Facility are paved. The GTF is also accessible by regularly scheduled airline flights to the airport in El Centro where rental cars are available. Transportation is not ordinarily provided by the GTF.



Figure 2. The Geothermal Test Facility is located at the Department of Energy, East Mesa Test Site.

INTRODUCTION

The U.S. Department of Energy Geothermal Test Facility (GTF) has been established by DOE to assist in more rapid commercialization of the geothermal energy potential by providing geothermal fluid and supportive services for tests of heat extraction and energy conversion equipment and materials. The Facility also actively promotes the exchange of reliable information among investigators within the energy community, and with the general public.

The Facility is located in the East Mesa area of California's Imperial Valley, 20 miles east of El Centro, California. It is operated for the U.S. Department of Energy by WESTEC Services, Inc., San Diego, California. Three geothermal fluid wells (Mesa 6-1, Mesa 6-2 and Mesa 8-1) have been piped to the test pad to provide experimenters with a range of chemical characteristics for flexibility in testing. Mesa 5-1 is used for reinjection. The wells, shown in Figure 1, were originally drilled by the Bureau of Reclamation for desalination research. Since then, BUREC has turned the wells and site over to DOE for use in DOE's geothermal programs.

Below is a partial list of companies and institutions who have used or plan to use the GTF at East Mesa:

- Aerojet Energy Conversion Company
- Allied Chemical Corporation

- Ampco Metal Division
- Argonne National Laboratory
- Austral-Erwin Engineering Company
- Barber-Nichols Engineering
- Battelle Memorial Institute, Pacific Northwest Laboratories
- Bi-Phase Energy Systems
- Brookhaven National Laboratory
- Daedalean Associates, Inc.
- Denver Research Institute
- Dowell
- DSS Engineers, Inc.
- General Ener-Tech, Inc.
- GeoThermal Services, Inc.
- Horst Power Systems, Inc.
- Hydrodynamics Corp. (CWC Products)
- Hydrothermal Power Co., Inc.
- Jet Propulsion Laboratory
- Johns-Manville, Inc.
- Lawrence Berkeley Laboratory
- Los Alamos Scientific Laboratory
- LFE Environmental, LFE Corp.
- McEvoy Oilfield Equipment
- Oak Ridge National Laboratory
- Occidental Research Corporation
- Peerless Manufacturing, Inc.
- Sperry Research Center
- Terra-Tek
- Turbines International
- United Wireline
- University of California, Berkeley
- University of Utah

dro Units
dro International
dro Industrial

GEO THERMAL TEST - "MHD" SCALE CONTROL

LOCATION: U.S. DEPARTMENT OF ENERGY TEST FACILITY
EAST MESA, (HOLTVILLE), CA.

DATES: FIRST TEST - APPROXIMATELY JUNE, 1979 THROUGH
DECEMBER, 1979

SECOND TEST - JANUARY, 1980 - APRIL, 1980

FACILITIES OPERATING MANAGEMENT COMPANY - WESTEC SERVICES, INC.

REPORT OF RESULTS - PREPARED BY BILL J. WITT, AREA REPRESENTATIVE
FOR HYDRODYNAMICS CORP., BOGALUSA, LOUISIANA

MANUFACTURER OF "MHD" EQUIPMENT: HYDRODYNAMICS CORP.
P.O. BOX 667
HWY 10, E.
BOGALUSA, LOUISIANA 70427

PURPOSE OF THE TEST: TO EVALUATE THE EFFECT OF THE HYDRODYNAMICS
"MHD" WATER TREATMENT SYSTEM ON THE SCALE
CAUSING MATERIAL IN A GEOTHERMAL ENVIRONMENT

RESULTS OF THE TEST: VERY POSITIVE - PROVED TO BE VERY COST
EFFECTIVE IN THIS ENVIRONMENT (SEE ATTACHED
REPORT).



SUBJECT: GEOTHERMAL TEST - HYDRODYNAMICS "MHD" SCALE CONTROL SYSTEM

Test was authorized by the U.S. Department of Energy for determining the effects of the Hydrodynamics Magnetic Water Treatment System scale buildup on equipment used in a Geothermal Energy production environment with its high temperature and high total dissolved solids.

PROBLEM

Under the extreme temperatures and high concentrations of dissolved solids in the water used for producing Geothermal Energy, the scale producing salts precipitate in to hard crystalline solids on surfaces of heat exchangers, cooling towers, plumbing, etc., causing inefficiency and much down time. Operations must be shut down often for descaling. This, of course results in lost production and increased operating costs.

SOLUTION DESIRED -

An economical solution to the scale problem that would automatically condition the water so that the scaled producing salts would stick to the heat exchangers and other equipment as scale, but would remain in solution throughout the entire cycle and be disposed in a non-harmful place. It should be non-harmful to the environment and non-polluting.

HYDRODYNAMICS "MHD" MAGNETIC SYSTEM

The Hydrodynamics "MHD" System consists of a highly directional sharply defined permanent magnetic field which interferes with normal crystalline precipitation of scaling salts. Instead of clinging as hard scale, a highly disordered, non-oriented amorphous crystal results that will not cling, but remain in solution to be carried through the system. These salts will fall out in a flow area such as a holding tank or settling pond. The process is based on the theory and requires no outside source of energy. It has no moving parts to be serviced.

THE HYDRODYNAMICS TEST

The test was conducted on the main producing well at the D.O.E. Facility at East Mesa, east of Holtville, California. The system was made and installed by Westec Services, Inc., Operating Contractors, for the East Mesa Facility. The system consists of two (2) flash chambers and one expansion chamber. One (1) chamber to be treated by the Hydrodynamics System and other untreated.

Water was pumped from the well through the two (2) flash chambers and on through the expansion chamber and out to the return line leading to the holding pond.

RESULTS OF TESTS

TEST NUMBER 1 - After approximately nine (9) days of operation, system was opened with the assistance of Mr. Bob Sones and Mr. J. Mooney and their crew from Westec Services. When the non-treated side was opened, it showed scale formed into a hard rocklike formation at the rear of the flash chamber just about stopping water circulation.

The most noticeable difference was shown when the expansion chamber was opened. Instead of being scaled solid, the non-oriented scale producing salts, flowed freely from the bottom of the tank to the pad below as non-sticking, sand-like material.

TEST NUMBER 2 - With the assistance of Westec Services, Inc., the test system was re-designed so that both treated and non-treated sides were identical, including two (2) Hydrodynamics Units. Each side has its own expansion chambers and identical flow rates. The one difference was that one (1) Hydrodynamics Unit was magnetized and the other was not. So again we had identical treated and non-treated systems for comparison purposes.

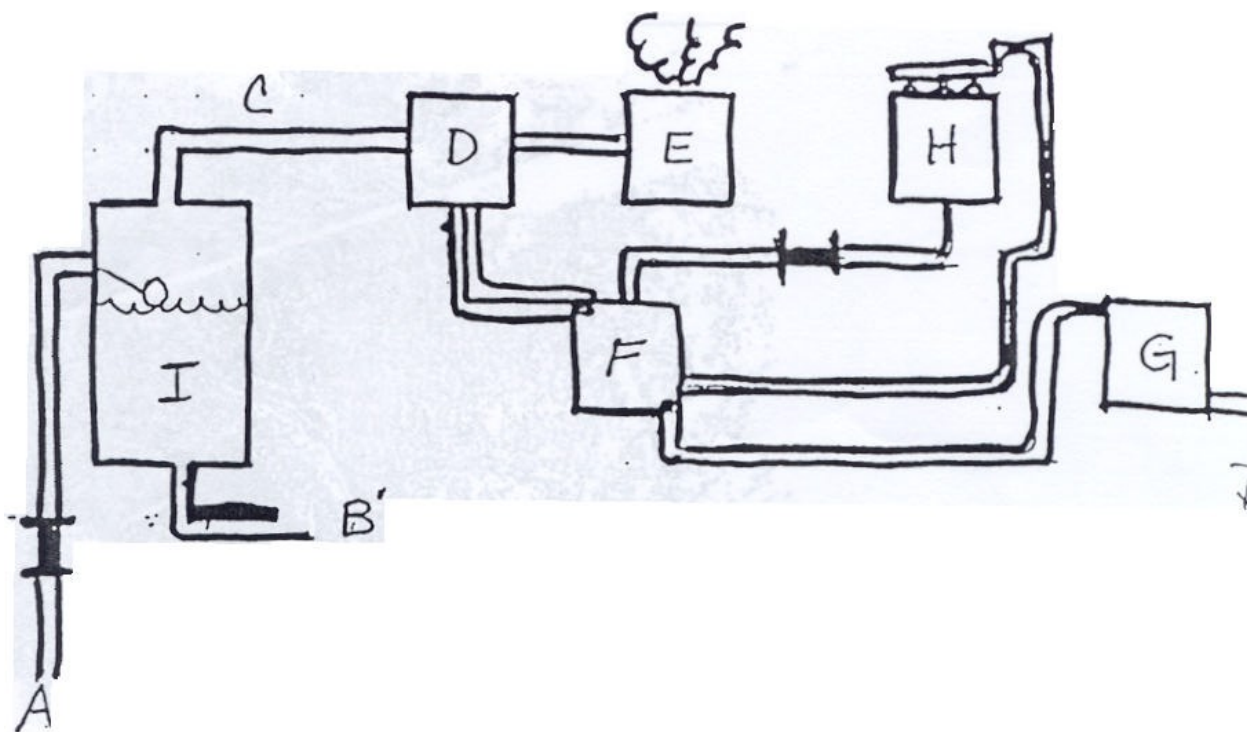
The test area received water sporadically from the well over a period of several months. Westec estimated that the actual time the test received flow was between 40 and 50 hours. We were not sure that this was going to be sufficient time for a good test.

The untreated side was opened first. A bucket was used to catch whatever water and residue was stored in the expansion chamber. When the valve located at the bottom of the chamber was opened on the non-treated side, only drips of water appeared. We used the handle of a wrench to break loose a hard rocklike scale that was clogging the valve opening.

The treated side was then opened and a fully flow of water came out showing no scale build-up.

CONCLUSION OF TEST

Identical tests using treated and non-treated water clearly show that the Hydrodynamics "MHD" Water Scale Control System can control and inhibit scale from forming in a Geothermal environment. The equipment used in this application will operate longer and more efficiently by using a Hydrodynamics System for treating the water.



This is a crude drawing of the typical Geothermal generating plants I have been involved in.

A. Is incoming geo-fluid at 340° F.

I. Is the expansion tank where the stream is flashed from the surface into the transfer line (C) which drives the turbine (D), driving generator (E). The steam leaving (D) and entering (F). (F) is tube heat exchanger. The heat exchanger is cooled by recirculating water from the cooling tower (H). The resulting condensate stored in (G) can be used for drinking, irrigation, etc.

The line (B) is the geo-fluid waste line. The installation of a HYDRO Unit will be in line (A) and also in the line coming from the bottom of the cooling tower (H).



EA

AMR

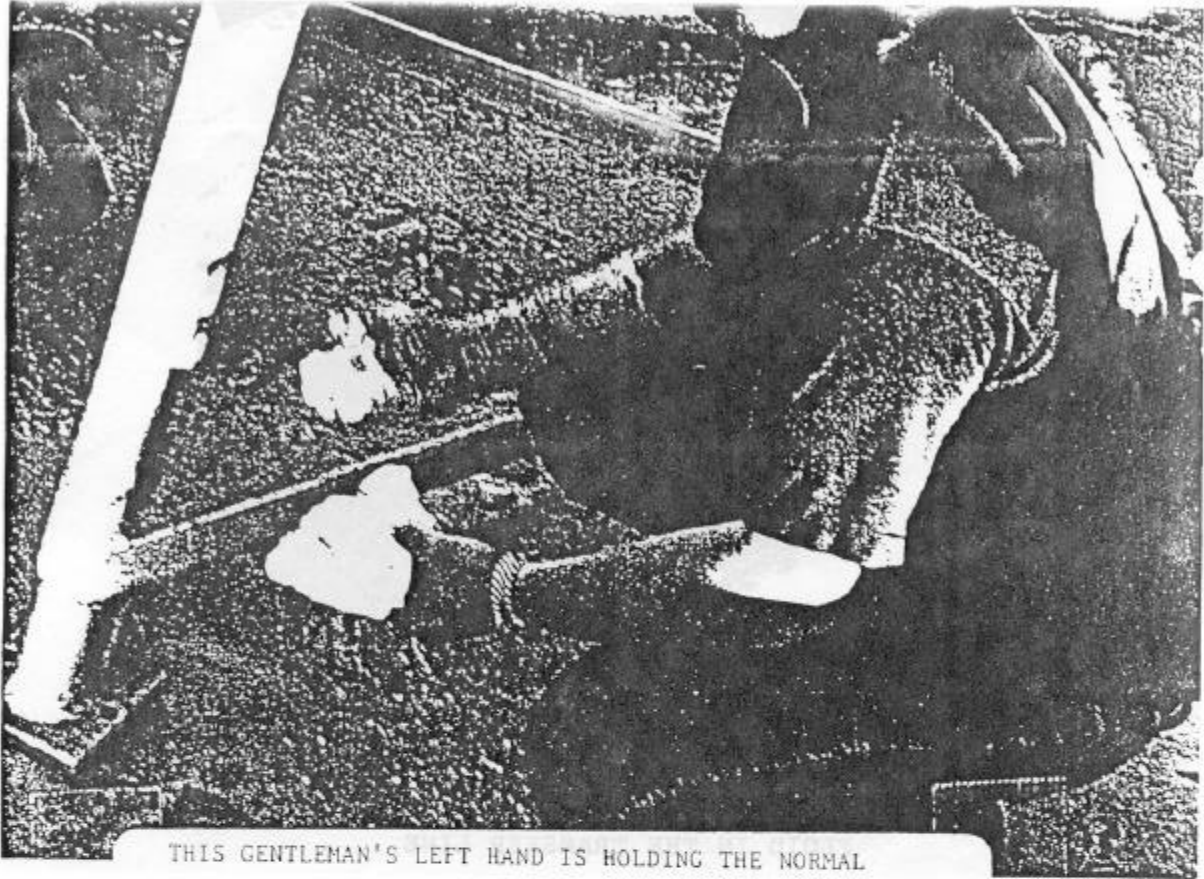
RA



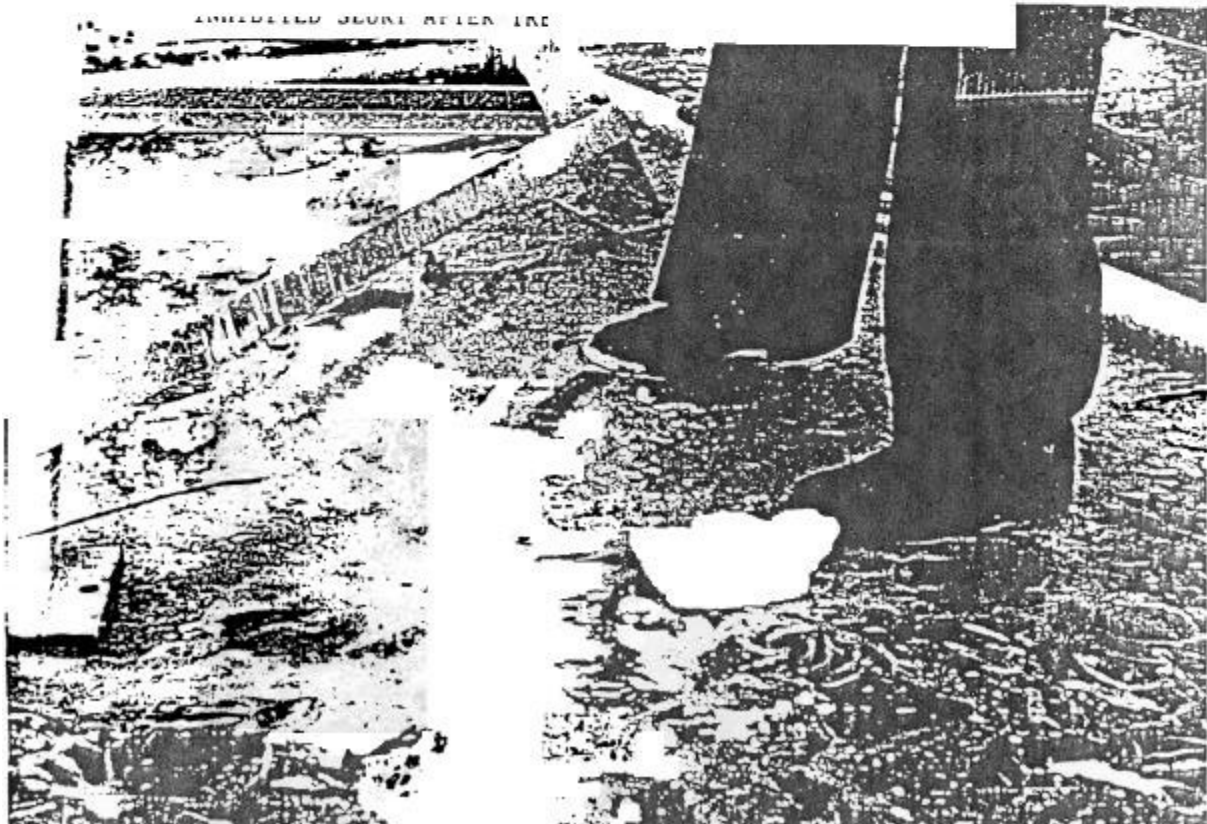
TOP PICTURE SHOWS THE DEPOSITED GEOTHERMAL
FLUID IN THE TRANSFER LINE.

BOTTOM PICTURE SHOWS THE DEGRADATION
OCCURRING 30 DAYS LATER.





THIS GENTLEMAN'S LEFT HAND IS HOLDING THE NORMAL



UNIDENTIFIED SCENE AFTER THE