

A red helix logo consisting of two intersecting loops with three dots at the top and bottom of the upper loop.

HelixTest

GEN

THE POWERFUL LEAK DETECTOR FOR
ALL APPLICATIONS IN POWER PLANTS



VARIAN

QUALITY SYSTEM
ISO9001
CERTIFIED

Use of HeliTest GEN for location of leaks on the steam circuit of a turbine of a working power plant

■ INTRODUCTION

Power plant turbines, regardless of the type of fuel used to generate heat in the boiler system, are turned by the steam generated by these boilers. The boiler heats pure water and converts it to steam which flows through the turbine in order to generate rotation of the power generator. After exiting the turbine, the steam is routed through a condenser which cools the steam to water. This water is returned to the boiler to start the cycle again. Typically the high pressure region of the turbine is working at a pressure of about 200 bar, while the low pressure region is working at a pressure of 35 to 50 mbar.

Because of the leaks that are inherently present in this type of system, a vacuum pump (ejector pump or water ring pump or a combination of the two) is used to maintain the low pressure region at the required values.

If a leak is being generated and causes an increase of the pressure in the low pressure region, it is absolutely important

to immediately locate it and repair it, since a small increase of some millibars can cause a consistent loss in the efficiency of the plant.

Various test methods have been used up to now; they range from very crude and low efficiency methods up to the use of



ultrasonic detectors, which do not fit well within a very noisy plant environment, or to the use of freon detectors, which require isolation of the part under test from the system, and must be abandoned because of atmospheric pollution restrictions.

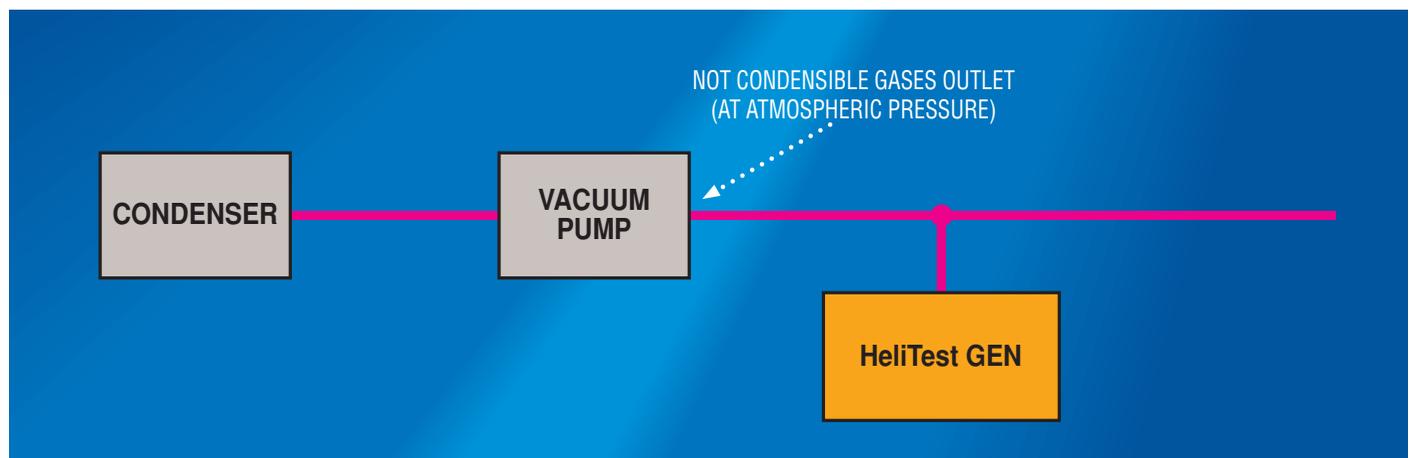
■ THE NEW TEST METHOD RECOMMENDED BY VARIAN

Varian is proposing a method based on helium as a tracer gas, which allows easy and quick location of leaks, and is therefore the best method to insure proper operation of power plants low pressure steam systems.

The use of helium is advantageous because it is non-toxic, non flammable, relatively inexpensive, and quickly diffuses through small leaks. In addition, helium is non reactive with other chemicals and, because of its low concentration in the atmosphere (only 5 ppm), very small leaks can be detected without the possibility of error.

This method allows the maintenance engineer the flexibility to perform leak tests while the plant is operational, without the need to isolate the sections under test, and a single operator can perform the full test. The detector recommended for this application is the Varian HeliTest GEN, derived from the basic HeliTest leak detector, used in many industrial applications, and well known for its high sensitivity to helium and its reliability in operation.

HeliTest GEN Connection to System



HeliTest GEN Benefits

The HeliTest GEN is a self-contained, rugged and easy-to-use leak detector, specifically designed to perform leak detection and leak location in power plant applications.

Most important benefits of this instrument are:

HIGH SENSITIVITY

The HeliTest GEN is sensitive to 2 ppm of helium, equivalent to 5×10^{-6} atm cc/sec.

This roughly corresponds to one cubic centimeter of air escaping from the leak every week or to a bubble escaping every day.

HIGH SELECTIVITY

The HeliTest GEN is only sensitive to helium, therefore no false signals created by the presence of any other gases are possible.

SIMPLE OPERATION

No specific operator training is required. The unit is designed to allow leak detection and leak location be performed by a single operator.

RUGGED CONSTRUCTION

Designed for continuous operation in industrial areas.

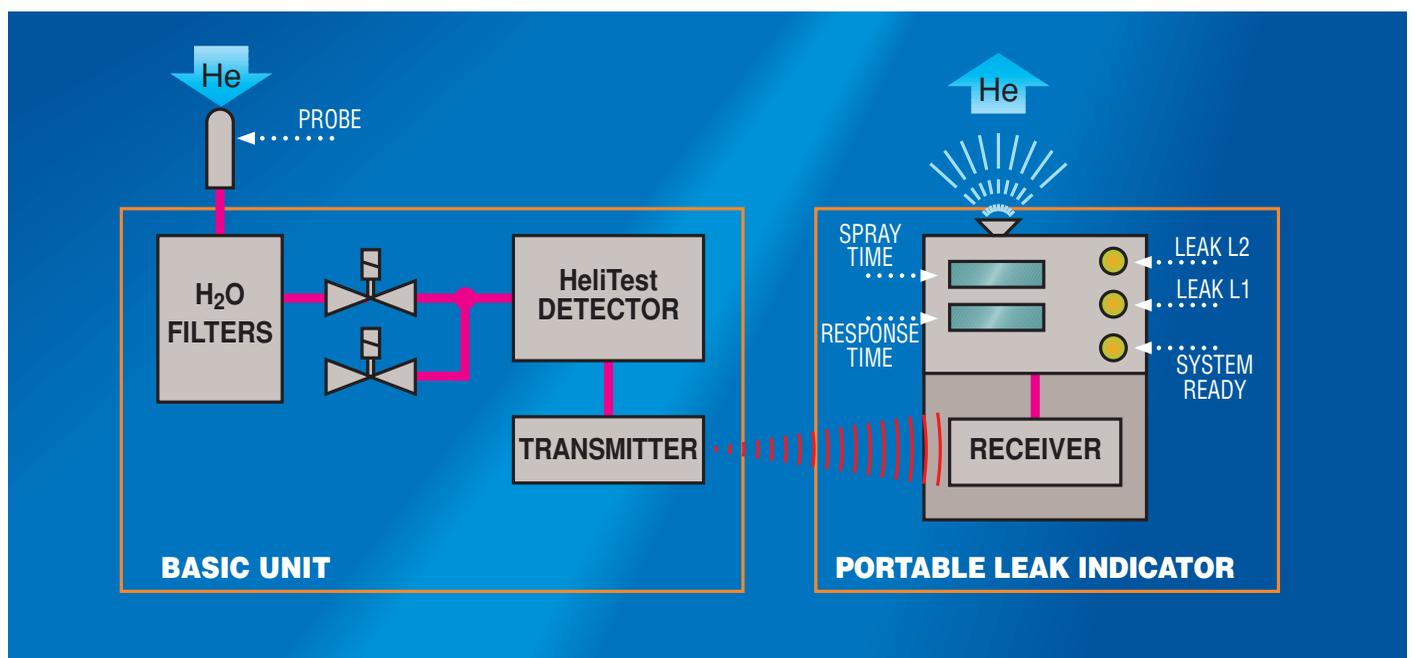
HIGH RELIABILITY

Varian long experience with HeliTest leak detector has allowed design of a very reliable instrument. Every time the unit is switched on, it automatically performs an autocheck cycle to ensure proper operation.

AUTOZERO

Use of automatic or manual zeroing system allows detection of leaks even in high helium background environment.

HeliTest GEN Operation





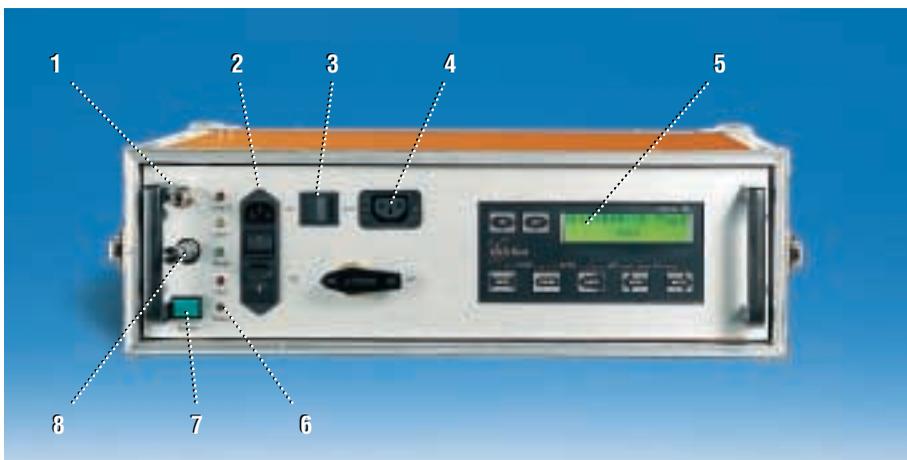
THE HELITEST GEN PRINCIPLE OF OPERATION

The HeliTest GEN is a leak detector based on what is called “Selective Ion Pump Detector” (SIPD). The principle of operation of this new technology is based on a special silica

membrane which, if heated to a given temperature, becomes permeable to helium, because of its small molecule, but not to other gases. An ion pump will detect and display a signal proportional to the quantity of helium that has permeated through the silica membrane, and this

signal will be displayed showing the helium leak rate. This system of operation is highly sensitive, due to the very low pressure in the ion pump (10^{-9} mbar), and very reliable, due to the absence of moving parts. In the HeliTest GEN a sample of the gas to be tested is pulled from the pipe or other object under test towards the sensor from a sampling pump. If this gas sample contains any helium, it will be detected by the basic unit, and a “leak” signal will be shown, allowing not only to determine its relative size, but most importantly to locate its position. The Portable Leak Indicator, that can be carried up to 2,000’ (600 m) away from the basic unit, will show a signal indicating that a leak has been found. The leak can be then rapidly repaired and equipment operation restored in the shortest possible time.

HeliTest GEN Basic Unit



- 1 – Sampling line
- 2 – Power
- 3 – Auxiliary pump switch
- 4 – Auxiliary pump power
- 5 – Leak signal
- 6 – Recorder output
- 7 – Bypass push-button
- 8 – Leak signal transmitter

■ HOW TO PERFORM A TEST IN A POWER PLANT USING THE HELITEST GEN

The HeliTest GEN allows performing leak detection and the specific location of leaks in the shortest possible time, and can be operated by a single person. In order to use this instrument, here is a short description of the operations to be performed.

1) The HeliTest GEN basic unit must be connected to the system under test. It is enough to connect the outlet of the vacuum pump to the HeliTest GEN inlet port.

2) After having connected the HeliTest GEN Basic Unit to the system to be checked, the operator starts to inspect the system and carries the HeliTest GEN Portable Leak Indicator. The indicator is then used by the operator to spray helium to the suspected areas, and to record the delay time for the helium signal to appear in case of a leak.

3) When helium enters the system through a leak, it is detected by the HeliTest GEN and the leak signal is shown both on the front panel of the unit and on the HeliTest GEN Portable Leak Indicator, which acts as a radio signal receiver. This signal will indicate both the size and the location of the leak. The operator can continue the search until all leaks are detected and located. The helium spray time and the response time are substantially dependent from the plant configuration and dimensions, and also from the distance between the check point to the place where the detector is located. Typically the helium spray time ranges from 15 to 30 seconds, and the response time, that is the time necessary to get a leak signal, from 20 to 90 seconds. The spray time and response time are also shown on the Portable Leak Indicator.

■ OTHER APPLICATIONS OF THE HELITEST GEN IN POWER PLANTS

In a power plant other leak checking jobs are often required, and they can generally be safely and easily performed using the HeliTest GEN.

Besides leak checking the heat exchangers, we can mention the power transformers and related equipment, as well as leak



checking underground pressurized power cables. These cables can be generally easily tested even if placed underground, thanks to the high diffusivity of helium, which can

move upwards from the leak location, allowing its detection without need to dig any holes on the ground.

HeliTest GEN Portable Leak Indicator



- 1 – Receiver
- 2 – Leak signal response time display
- 3 – Helium spray time display
- 4 – Helium spray pipe
- 5 – Ready signal
- 6 – Spray Helium button

