PETROLEUM PROCESSING

VOLUME 1, NUMBER 1 SEPTEMBER, 1946

Complete Houdry Case Inspection During Regular Catalyst Change

New Inspection Instrument Makes Possible Complete Visual Examination of Tubes and Lower Tube Sheet During Normal Turnaround of Modified Houdry Cracking Cases at Sun's Toledo Refinery

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USING a new type inspection device, and at no additional time beyond the normal turnaround for catalyst change of 7 to 10 days, Sun Oil Co. recently completed a thorough and rapid visual inspection of the 12-case Houdry unit at their Toledo refinery. Included in the inspection were cracking case interiors, cooling tube exteriors, lower tube sheet surfaces, and threaded sockets for the air and oil vapor tubes. Turnaround was handled on contract with Sun by Catalytic Construction Co.

A year ago this Houdry unit was changed over to the new modified design which permits easy removal of the catalyst and the air and oil vapor tubes without completely dismantling the case, and which reduces the off-stream time from the previous 6 to 7 week period to between 7 and 10 days.*

As used in this application, the new instrument gave Sun's refinery men visual information as to the condition of the cooling or salt tubes, the surface of the lower tube sheet, and the sockets for the air and the oil vapor tubes.

Two men, using a pair of "Tubescopes", as the instruments are called, were able to complete the inspection of one cracking case every 24 hours. Scheduled so as not to interfere with other operations on the case, this inspection took place during the removal of the air and oil vapor tubes and catalyst.

The Tubescopes were designed and built for Sun by the Lenox Instrument Co., Philadelphia. The inspection at Toledo was the first time a Tubescope has ever been used in an oil refinery in the U. S.

Lenox designed and built a similar instrument for the Bahrein Petroleum Co. three years ago for inspecting horizontal stainless steel tubes in the cracking furnaces of their refinery on Bahrein Island. That application was the first time anywhere for the Tubescope in the oil industry. It differs from the use at Toledo in that it was used horizontally and inside the tubes, whereas at Toledo it was suspended vertically between the salt tubes and used to examine exterior surfaces.

Consisting primarily of a long slender dural tube with an eyepiece at one end and a system of lenses, mirrors, and powerful electric lamps at the other, the Tubescope provides the inspector with a means for looking inside dark and inaccessible places, as for example, the interior of a Houdry case.

Fundamentally, the Tubescope, the head of which is shown in Fig. 2, is an illuminated periscope built along the lines of a telescope. There is the usual focusing eyepiece and about 6 ins beyond this is a revolving electrical connection or collar having a screw lug on its surface to which the lighting cable from a transformer is screwed. By this method of attaching the cable, the Tubescope can be rotated without interference.

In use, the instrument is suspended vertically and placed in the desired position above the Houdry case by a derrick. It is then lowered through a hole in a supporting beam, and its height controlled by an adjustable clamp collar which rests on the supporting beam. Thus it can be held at any desired height

Sun's inspection crew guides the head of one Tubescope into position inside a Houdry case from which catalyst and air and oil vapor tubes have been removed. Second instrument is already in position for use on movable wooden supports. With these instruments a complete visual inspection of the interior of the case can be obtained during the regular catalyst change period

* An article describing the new Houdry design may be found on page 37 of this issue of PETROLEUM PROCESSING.

for examining any point along the salt tube from the top to the lower end.

The optical system consists of a number of high grade achromatic and simple lenses which are distributed throughout the length of the instrument in such a way as to carry the distant image to the eyepiece and produce a magnification of approximately three times.

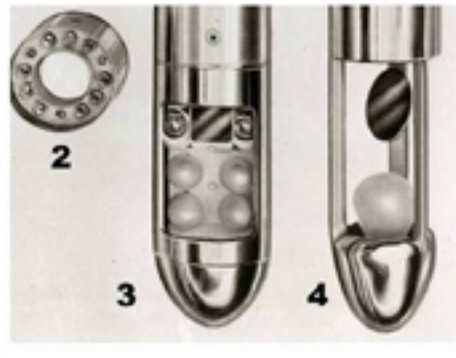
Dural tubing is used because of its light weight and strength. The Tubescope consists normally of four sections. The two end sections are each 2¼ ft. long, and between these there are two 10 ft sections, either or both of which may be left out if a shorter instrument is desired. The outside diameter of the tubing is 1¾ in. The sections are rigidly joined by special internal bronze couplings consisting of a long pilot slide and screw combination designed to carry the lighting current from section to section.

The wires in the tubes pass through notches in the periphery of the brass lens cells, the latter being held in their correct location by sections of thin bakelite liner tubing which are finely threaded internally in order to trap stray reflections. These inner tubes also support the wires.

Several types of illuminated viewing heads are made by Lenox, of which Sun uses three. One is designed simply for a straight ahead view. Shown in Fig. 2, it is illuminated by a crown of nine small but powerful 6 volt lamps.

For lateral viewing, a prism head having six lamps is used, as shown in Fig. 3. This head is ideal for the most critical inspections and for photography.

Under certain circumstances a circumference head is used. This has but one large lamp, which like those in the prism head can be used under stepped up voltage. This head, shown in Fig. 4, gives an all around view, and is therefore useful for quick work.



Figs. 2, 3 and 4—Various viewing heads suitable for different types of inspection. Fig. 2 (left) is the head used for straight ahead examination. Fig. 3 (center) shows a prism head with six lamps for lateral viewing, used for critical inspections and photography. Fig. 4 (right) has only one large lamp and a large mirror which permits rapid examinations

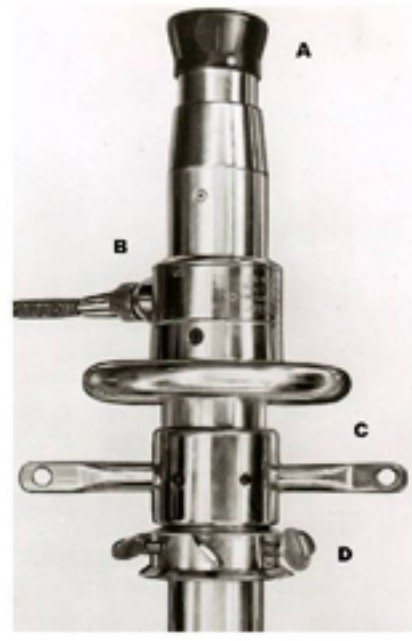


Fig. 1—Eyepiece section of Tubescope, showing (A) focusing eyepiece, (B) electrical connection collar, (C) yoke and hooks for suspension cable, and (D) supporting collar

Sun inspectors have found it helpful to augment the illumination provided by the Tubescope by suspending an additional droplight in the cracking case at a point near the instrument.

Where a permanent record in the form of a photograph is desired, Lenox manufactures a specially designed camera of the graflex type which can be fitted directly on the eyepiece of the Tubescope.

Although obtained primarily to improve the inspection of the Houdry units, the Tubescope will probably find increasing use in other inspections, Sun officials believe. Such applications would include furnace tubes, condenser coils, coolers, heat exchangers, product lines, and many others.

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