MANUAL ON INSTALLATION OF REFINERY INSTRUMENTS AND CONTROL SYSTEMS

PART IV—STEAM GENERATORS

FIRST EDITION
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FOREWORD

This is the fourth part of the manual and represents the latest suggested or generally used practices in the installation of the kinds of devices covered in Parts I and II as they apply to the measurement and control of steam generators.

Part IV covers recommended practices that specifically apply to instrument and control system installations for steam generation facilities in petroleum refinery and other hydrocarbon processing plants. The installation of primary measuring instruments, control systems, alarm and shutdown systems, and automatic startup and shutdown systems are discussed for steam generators, carbon monoxide or waste gas steam generators, gas turbine exhaust fired steam generators, and unfired waste heat steam generators.

Successful instrumentation depends upon a workable arrangement that incorporates the simplest systems and devices that will satisfy specified requirements. Schedules, drawings, sketches, and other data should be provided in sufficient amounts to enable the constructor to install the equipment in the desired manner. The various industry codes and standards and the laws and rulings of regulating bodies should be followed where applicable.

For maximum plant personnel safety, it is recommended that transmission systems be employed to eliminate the piping of hydrocarbons, acids, and other hazardous or noxious materials to the instruments in the control rooms.

The instrument installations should be carefully analyzed for good operation. The various components must be accessible for efficient maintenance, free of vibration, and certain of these elements should be located for convenient readability. Orifices, control valves, transmitters, thermocouples, level gages, and local controllers, as well as analyzer sample points, should, in general, be readily accessible from grade permanent platforms, or fixed ladders. In this manual special consideration is given to the location, accessibility, and readability of the elements.

Proper installation is essential in order to utilize the full capabilities that are built into the instrument systems and to realize the greatest return on the investment. In many instances, the instrument difficulties encountered have been traced to incorrect installation.

This part of the manual has been written as a general guide for designing and installing operable, safe, and efficient instrument and control systems for steam generators in petroleum refineries and related plants. It is intended to be used as a complement to Parts I and II of the manual. As such, it should be useful to design engineers, instrument construction and maintenance personnel, and process operators. It is no substitute for experience and proficiency in these fields, although it will be a help in achieving such experience and proficiency. Because of the lack of uniformity in the design and requirements of these processes, the complete instrumentation and control system must be studied to determine if it will enable the unit to be operated, started up, and shut down satisfactorily and safely.

T[illegible]are many specific features of these installations that require special attention [illegible]rder to assure safe and efficient operation of the plant and to ensure that the p[illegible]t can be started up or shut down with safety to the operating personnel and without damage to the equipment or to the processes that it serves. Special effort

has been made to point out pitfalls in these installations but only a general guide can be established. Those concerned with the general installation will find it necessary to think through the function of each installation for each probable operating condition.

Background information is presented to show the reasons for customary installations. This has necessitated discussion of the processes, instrument application, and instrument design. For this reason, Part IV of the manual is organized with the different processes as the major headings and the types of measurement or control function as subheadings under these processes.

There are enough unique instrumentation and control problems in these systems to require treatment separate from process control on refinery units. In the past, combustion control has developed along a path that has been considerably divergent from the development of process control. Consequently, process operators and instrument mechanics have required special training to handle the steam generator instrumentation that has been integrated with the process unit control centers. Control system design engineers familiar with one kind of plant have usually not felt proficient with the other. Actually, many of the differences are more apparent than real. For this reason, the specific problems, differences, and similarities in the installation of these instruments and control systems are discussed.

The features of instruments and control systems that are covered sufficiently elsewhere in the manual are not covered in this section. Therefore, frequent reference is made to Parts I and II of the manual.

The steam generation facilities must be considered as an integral part of the refinery or process plant. These facilities cannot be considered separately even from the safety shutdown standpoint because a steam supply failure to some processes may be more dangerous to more personnel and equipment than taking a low level risk with the steam generation facilities by not shutting down on certain upsets. The overall view should include all risks due to direct process upsets, shutdown and startup of affected processes, and loss of essential utilities such as fire water, as well as what might happen to the steam generation facilities.