

Manual on Installation of Refinery Instruments and Control Systems

Part I—Process Instrumentation and Control Section 11—Electrical Power Supply

Refining Department

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Part I—Process Instrumentation and Control

SECTION 11—ELECTRICAL POWER SUPPLY

11.1 Scope

This section is intended as a guide for the design and selection of equipment for a highly reliable electrical power distribution system for plant process instrumentation and controls. For additional information on the installation of electrical systems, refer to API RP 540, *Recommended Practice for Electrical Installations in Petroleum Processing Plants*.

11.2 General

A supply of continuous electrical power to a plant process instrumentation and control system is essential for safe operation and the manufacture of on-grade products. When power interruptions occur, the plant must be designed either to continue to operate on standby steam-driven turbines or to shut down in a safe and orderly manner. Control systems and monitoring devices must continue to provide information and control during this period; therefore, the electrical power system reliability requirement is much greater for instrument system supplies.

11.2.1 PLANT POWER RELIABILITY

The reliability of the service to a plant depends on many factors. Utility companies invest considerable time and effort in improving the reliability of their systems. This includes providing redundant equipment, alternate sources of power such as neighboring electrical utilities, and various contingency plans to permit operation during emergency conditions.

The reliability of electric power varies from region to re-

gion, and in most areas seasonal outages are predictable. Unpredicted events, such as earthquakes or man-caused disasters, also cause long, unexpected outages or curtailments.

The configuration of the transmission and distribution system can be arranged to provide maximum reliability. For an all-electric-drive plant where service is critical, at least one redundant feeder line is required together with transformers, main breakers, and a tie-breaker for fast automatic transfer. Typical utility substation arrangements are shown in Figure 11-1.

If the plant has sufficient steam and electric operation is only a matter of economics, then a single utility feed could be used with steam-driven turbines to back up electric motors. Most utility companies will provide whatever configuration the customer requires. In return for this service, a facilities charge may be added to the monthly billing for any electrical equipment which exceeds what the utility company considers necessary for standard service.

The trend in the processing industry is to rely more heavily on the utility company's ability to deliver power with minimal, if any, interruption. New plants are relying less on uneconomical standby steam drivers, especially in locations where the utility has a reliable service record.

As a result, only the critical services, such as essential digital and analog control systems and shutdown circuits, are being served with uninterruptible power supplies in new installations. The processing portion of the plant is left to circulate down as much as possible by using critical-standby steam drivers (generally on circulating pumps) when power failures occur.

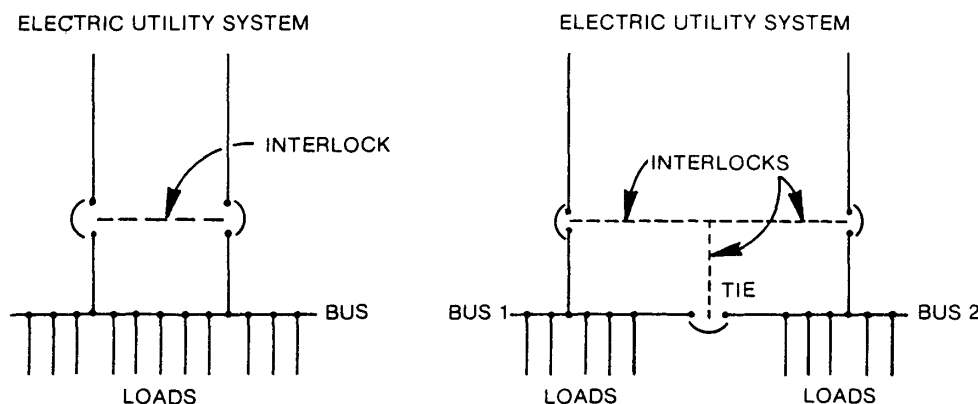


Figure 11-1—Secondary Transfer Using Circuit Breakers