Association (10). The wording of the A.A.R. rules and the M.C.A. recommended practice is almost identical except that M.C.A. has added a recommendation against bottom unloading, some warnings against the use of ferrous tools, and some rather elaborate static-grounding procedures. None of these additional precautions is followed in our bulk plants because we are convinced they do not provide additional safety. Many years of experience have borne out this contention.

WE do not plan to discuss in detail the requirements of the National Electric Code and definitions of the various classes, groups and divisions which provide the basis for determination of the types of electrical equipment suitable for various parts of petroleum handling facilities. Certainly in refineries any over-all requirement for Class I, Group D equipment throughout cannot be justified. However it is desirable to provide only explosion-proof, electrical pumping-equipment throughout our own bulk storage plants. (This is not necessarily a general practice in the petroleum industry but one where the additional cost can be justified.) With fixed equipment for normal operation this is a simple matter to control. Where repair work is being performed or temporary equipment is being used, we have occasionally found a gasoline-engine-driven pump being used. These have caused fires and should not be used in solvent storage and unloading operations except possibly in extreme emergency.

An extension of the reasoning and experience which justifies the exclusive use of explosion-proof motors and switches cannot include a requirement for "permissible" flashlights (11).

It is our policy to provide fixed fire-protection at bulk storage plants only where this is required by local ordinance or regulation. This policy is based on experience of low fire-loss in this type of operation. In 1955 the petroleum industry reported to the American Petroleum Institute (1) on 14,289 bulk plants with an investment of more than $685,000,000. In that year there was a total of 48 fires with an average loss per fire of less than $3,000. The total loss ratio was 2¢ per $100 of investment. Incidentally none of these fires spread to other property. In our own experience over the past 10 years we have had just one bulk-plant fire while unloading petroleum liquid. This occurred in 1950 when a storage tank was overfilled because our plant man failed to gauge the tank prior to emptying a tank-truck load into it. Fixed fire-protection would not have extinguished this fire. We have had three tank-fires during the past 10 years. All of these occurred while the tanks were being prepared for cleaning, and all three occurred as a result of failure to follow simple procedures. Two were extinguished by portable extinguishers, and the third was extinguished by the municipal fire department.

We provide no extinguishing equipment specifically for tank fires in bulk-storage plants. Pumps and unloading racks are protected with hand-portable, dry-chemical extinguishers except at very large installations where larger, wheeled, dry-chemical units are provided.

We have attempted to point out in this paper some conclusions reached as a result of many years of experience in handling petroleum products in the petroleum industry. Many of these conclusions have resulted in the adoption of procedures which are notably less restrictive than procedures governing similar operations in the solvent-extraction industry. Certainly the fact that the handling of petroleum products is incidental in your industry and primary in ours may give rise to justification of differing procedures.

Our purpose has been to point out some of these differences, to provide some justification for the procedures we endorse, and to stimulate some discussion concerning them.

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Safety in the Solvent Pilot Plant

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BY DEFINITION a pilot plant is a guiding or steering plant. Webster would call it a plant "to guide one through difficulties." A pilot plant therefore is employed to find possible fallacies in equipment design and operation on a small scale and to correct those fallacies at a relatively low cost.

The purpose of a commercial-scale, solvent plant is to provide an uninterrupted extraction of one material from another. This purpose implies continuous, or at least uninterrupted, batch operation. On the other hand, the purpose of a solvent pilot plant is to provide for the study of the extraction of one material from another. This purpose implies interrupted operations.

The operations in a pilot plant are interrupted because alterations in equipment or flow of materials may be required as the study progresses. The plant must therefore be shut down to make these necessary alterations. Furthermore certain changes may be required because of the nature of the raw material being studied or because of the nature of the study itself. For example, one company may request that a raw material be extracted but not desolventized. This necessitates the disjoining of the desolventizing drier from the extraction system and the collecting of the extracted material wet with solvent. Another company may request that the miscella from an extraction be collected after distilling to a rich miscella of 50% solvent or not distilled at all. Another customer may request that an extracted, solid material be mechanically desolventized instead of thermally desolventizing.

These conditions inform the design engineer and the operator that the solvent pilot plant must be shut down and started up perhaps one or two times a day. And yet the solvent pilot plant must be capable of 24 hours a day, seven days a week operation when required.

Other papers in this symposium have emphasized the extreme importance of continuous, smooth operation of a commercial-scale, solvent plant in relationship to safety in that plant. They have stressed the importance of plant design, safety engineering, and safety equipment in the reduction of hazards in the operation of commercial-scale, solvent plants. The relative merits of steam purging *versus* inert gas-purging, the importance of ventilation and many other aspects of safety have been likewise thoroughly discussed. All of these factors are important to the safe operation of a pilot plant.

ONE FACTOR however that cannot be systematized, recorded, or scientifically detected is the human factor. One can provide an immense fan to ventilate the pilot-plant area, but to do any good the fan must be turned on.

As far as specific safety items are concerned, the solvent pilot plant is designed in accordance with the same safety specification of commercial-scale equipment. Double fire doors and a fire wall separate the plant from the rest of the building. The floor of our pilot plant is elevated approximately 15 feet above the ground and three feet below the floor elevation of the adjoining Expeller pilot plant. Sufficient floor ventilation is provided to change the air in the plant area once every three minutes. In addition, the length of one wall is provided with windows. At shut-down all solvent is pumped or drained into vapor-tight containers. Sparge steam is utilized for purging prior to equipment alterations. If the pilot plant is to be left idle, all solvent is pumped to storage and the entire unit is purged.

The above and other safety features and procedures are employed. The one greatest hazard however is the possible lack of attention and alertness on the part of operators through repeated start-ups and shutdowns. To counteract the possibility of this apathy a constant program of safety consciousness is followed. Operators are constantly alerted by the head of the pilot plant, and he in turn is alerted by his superior. Many men can check the design and safety features of a plant, but only one man and one nervous system controls the hand that operates. This operator then becomes the last link separating damage from safety. He is worth attention at least equal to that given the solvent-detection system.

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Report of the Technical Safety Committee, 1956-1957

THANKS to the Local Committee, which supplied a stenographer for the purpose, the minutes of the Technical Safety Committee meeting in Houston on April 4, 1956, were recorded, and copies were supplied to those in attendance and to those who subsequently were appointed to the Technical Safety Committee of the American Oil Chemists' Society. Likewise minutes of the Technical Safety Committee meeting in Chicago on September 25, 1956, were recorded in detail, thanks to the Local Committee which provided the services of a stenographer, and copies were supplied to the members of the Technical Safety Committee. Also, the minutes of both of these meetings were published in appropriate issues of the Journal so they will be a matter of record in the years to come.

At Chicago the committee conducted a safety symposium during which six articles on various phases of technical safety were presented and subsequently published in the March 1957 issue of the Journal. Authors were H. D. Fincher, N. H. Witte, and P. Kane; A. E. MacGee; W. F. Bollens; R. P. Hutchins; and O. J. Jones, H. R. Belew, and O. L. Williams.

In Chicago it was decided that the Technical Safety Committee would be composed of three subcommittees, Solvent Extraction, Laboratory, and General Plant. Paul R. Sheffer was named vice chairman of the Solvent Extraction subcommittee and Harold H. Schultz vice chairman of the Laboratory subcommittee.

The Solvent Extraction subcommittee established three task groups: Safe Operations and Rules under N. H. Witte; Accidents Review under H. D. Fincher; and Corrosions and Erosions under F. P. Parkin. And sufficient work has been done on these subjects for a progress report at the New Orleans meeting.

Likewise the Laboratory subcommittee has been exploring the possibility of developing more satisfactory methods of determining residual solvent in both extracted oils and meals. A preliminary report is expected at the present New Orleans meeting. The Technical Safety Committee is composed of 33 members, of whom 18 are assigned to the Solvent Extraction subcommittee, nine to the Laboratory subcommittee, and five to the General Plant subcommittee.

As a result of the cooperation of various members of the committee during past months there have been prepared some eight articles for presentation at another Technical Safety symposium at the New Orleans meeting, and it is of course planned that these articles subsequently will be published in the Journal.

During the past months there were obtained and sent to members of the committee and officials of the Society the following publications as a matter of general information and help along safety lines: a) Office Safety, b) Safe Practices and Information for Employees of E. I. DuPont de Nemours and Company, c) Safety—Task Assignment, d) Safety Information and Instructions for Contractors, e) Lightning, Its Behavior and What to Do About It, f) Occupancy