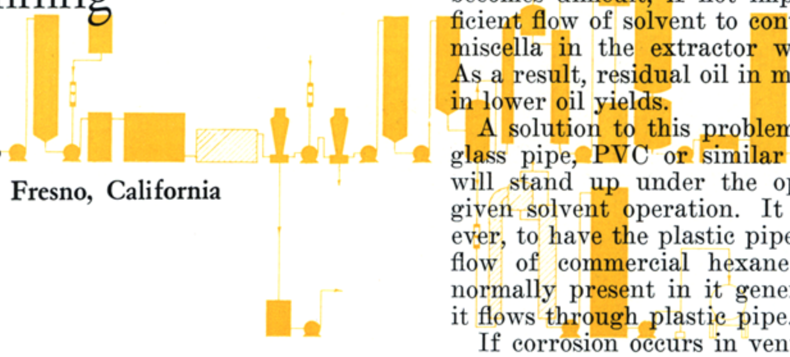
Safety in Solvent Plant Operation and Miscella Refining[1]



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Abstract

Some of the safety hazards in solvent plant and miscella refining operations are enumerated. Recommendations for minimizing or eliminating these hazards are proposed.

Proper plant design, intelligent operation and meticulous attention to preventative maintenance will in most cases anticipate trouble spots and correct them before operating problems occur.

General Safety Aspects of Solvent Plant Operation

THE NORMAL CONSIDERATIONS given to safety in the solvent plant are also applicable to the miscella refinery. These concepts of safety in solvent plant operations have been in general well defined by the industry, the National Fire Protection Assoc. and other regulatory agencies to the point where we have a manual covering most of the situations involving safety that could arise from the construction and operation of a solvent extraction plant. Under normal operating conditions in a solvent extracting plant, materials being extracted and solvents and vapors confined in the vessels and conduits designed to handle them, present no safety hazard. Conversely, incomplete or improper desolventization of oil or meal and escaping solvent or miscella from whatever source does present a safety hazard.

On page 36 of National Fire Protection Association manual, No. 36, under the paragraph titled "Vent Vapor Recovery Systems," we find the following: "Where the extraction plant is running well within its rated capacity and with adequate cold water for condensing, the vapor pressure of the vent will be practically zero and the vent losses would be negligible. Where there is a slight vent pressure and the vent gas temp is somewhat higher than the atmospheric temp, considerable loss of solvent will occur and even in the case of using a simple condenser in the vent system, some loss will be sustained."

Any vent line pressure in excess of two ounces/sq. in. can result in excessive solvent losses. Corrosion in vent lines and ancillary equipment can be a contributing factor to vent line pressure build-up.

Commercial hexane contaminated with moisture and organic matter from materials being extracted is very corrosive to mild steel. The result of this corrosion is a spongy iron compound which in a matter of months badly corrodes pipe and vent lines, mild steel tanks, and impedes the flow of material throughout the solvent plant. Also, this material which breaks away from its point of origin contributes an additional source of iron contamination to finished products. Solvent supply lines can become so corroded that it becomes difficult, if not impossible, to maintain sufficient flow of solvent to control the concn of the full miscella in the extractor within the desired limits. As a result, residual oil in meal goes up which results in lower oil yields.

A solution to this problem is to use stainless steel, glass pipe, PVC or similar type plastic pipe which will stand up under the operating conditions of a given solvent operation. It is most important, however, to have the plastic pipe properly grounded. The flow of commercial hexane with the contaminants normally present in it generates static electricity as it flows through plastic pipe.

If corrosion occurs in vent lines, openings into the vent lines may become restricted, resulting in localized pressure build up to a point where solvent losses become excessive. Pressure gauges and thermometers at frequent intervals in the vent lines and across each piece of distilling and condensing equipment are essential for proper operation and maintenance.

The temp encountered in solvent vent lines and evaporating equipment frequently exceeds the design capabilities of PVC or other types of plastic pipes. Epoxy or other baked-on coatings can be applied to mild steel vent pipes to give both rigidity and chemically inert surface for conveying hot solvent vapors. It is now common practice to use some formulation of stainless steel for condensers and evaporator tubes. More and more modern plants are going to stainless steel or glass pipe for all product piping and vent lines.

Safety Aspects of Miscella Refining

Miscella refining can be economically practiced at a location other than a solvent extraction plant on crude oil reconstituted with hexane. However, the greatest economic advantages of labor saving, lighter color oil, and lowest possible refining losses must take advantage of the low processing and refining temp possible only at the solvent extraction plant prior to stripping the solvent from the oil.

Solvent plant operators who are already trained in basic rules for handling solvent safely usually can take the additional responsibility of operating a miscella refinery with no additional help. There are a few areas in miscella refining that do differ from the conditions normally encountered in a solvent plant. For instance, the bowls on some tubular type centrifuges turn at 15,000 rpm. These machines should be well guarded, grounded and vented. They are usually driven from the top with a 3600 rpm motor by pulleys and a belt. It is most important that this belt be fabricated from static conducting material. The soapstock and refined miscella should be conducted away from the centrifuge in closed conduits without exposure to atmosphere.

Disc stack type centrifuges are usually driven from the bottom with a bevel gear driving arrangement. The bowl of a disc stack centrifuge is usually of larger diam, slower speed and greater mass than a tubular type machine. Unless properly sealed with

(Continued on page 21)

[1] Presented at the AOCS Meeting, Minneapolis, 1963.

Solvent Plant Safety . . . .

(Continued from page 4)

mechanical seals solvent, miscella, and/or caustic, soapstock can be forced into the gear case with resultant gear failure.

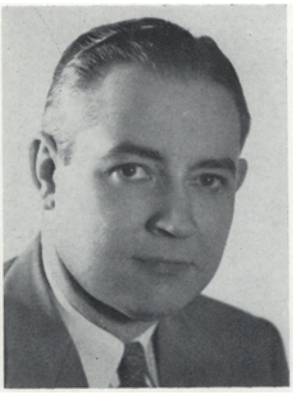
As in making good wine, patience is also a virtue in miscella refining. No friction brakes can be allowed to stop the bowls of miscella centrifuges because of the heat generated. Some bowls require 20 min or longer to come to rest.

Proper precautions should be exercised in handling caustic soda solutions just as in conventional refining. A weak acetic acid solution or a buffered solution for neutralizing either acid or caustic should be available at every floor level where there is a possibility of caustic spillage. As a general rule, miscella refining requires less amount of a weaker concn of caustic to refine to a given Lovibond color than conventional refining. In this respect, miscella refining could be considered safer than conventional refining.

Miscella refining eliminates one of the undesirable jobs that is periodically necessary in a crude solvent extraction plant. That is, shut downs to boil out and clean out the crude oil solvent recovery system. Gums that deposit in the distillation equipment at the stripping stage may build up to the point where heat transfer is impaired resulting in low flash or wet oil. This is completely eliminated when the phosphatides, gums, free fatty acids and most of the pigments are removed from the miscella by caustic refining prior to entering the distillation system.

• *Names in the News*

Three AOCS members are among the first group of 41 Fellows of the Association of Official Agricultural Chemists to be honored during ceremonies at their 78th Annual Meeting, scheduled for Marriott Motor Hotel, Twin Bridges, Washington, D.C., Oct. 19–22, 1964. They are Jacob Fitelson (1941), E. L. Griffin, Jr. (1959) and F. W. Quackenbush (1943). The honorary title of Fellow of the AOAC was created in 1961 for recognizing meritorious service to the Association.



F. W. Quackenbush

E. F. Binkerd

E. F. Binkerd (1946) has been appointed manager of research for the Foods Div. of Armour & Co. He formerly served as laboratory manager of the company's food research center at Oakbrook, Ill.

G. H. Pogeler, manager of the North Iowa Soybean Cooperative in Mason City, Iowa, for the past 21 years, has been named president of the Soybean Council of America, Inc. He replaces H. L. Roach, Plainfield, Iowa, who will become chairman of the Council's board.