areas of Texas and Louisiana. These permits were finalized January 9, 1995 (60 FR 2387). The permits would not, however, apply to facilities treating offshore waters and discharging into the main passes of the Mississippi and Atachafalaya River. Based on these permits requiring zero discharge, only Alaska's Cook Inlet and two sites in the Gulf of Mexico would be discharging produced water in the Coastal subcategory at the time this final rule is scheduled to be signed, currently July 1996.

The current BPT regulations established for the coastal subcategory limit the oil and grease content in the discharged produced water. Existing technologies for the removal of oil and grease include gravity separation, gas flotation, heat and/or chemical addition to assist oil-water separation, and filtration. Methods for the discharge or disposal of produced water from facilities in the coastal subcategory include free fall discharge to surface waters, discharge below the water surface, use of channels to convey the discharge to water bodies, and injection via regulated Class II Underground Injection Control (UIC) wells into underground formations. As an alternative, a number of production sites transport produced water by pipeline, truck or barge to shore facilities for disposal in UIC Class II wells. At times, this transport consists of the gross fluid produced and the oil-water separation takes place at the off-site facility.

While sampling data has indicated quantifiable reductions of naphthalene, lead, and ethylbenzene by BPT treatment (*i.e.*, by oil-water separation technology), this data also demonstrates the presence of significant levels of priority pollutants remaining in the treated effluent.

b. Additional Technologies.

In developing the proposed regulation, EPA evaluated several treatment technologies for application to the produced water wastestream. These technologies were considered for implementation at the coastal production sites and at the shore facilities where much of the produced water is currently treated for subsequent discharge to coastal subcategory waters.

(1) Improved Gas Flotation.

Gas flotation is a treatment process that separates low-density solids and/or liquid particles (*e.g.*, oil and grease) from liquid (e.g., water) by introducing small gas (usually air) bubbles into wastewater. As minute gas bubbles are released into the wastewater, suspended solids or liquid particles are captured by these bubbles, causing them to rise to the surface where they are skimmed off.

EPA considered as an option using gas flotation technology with chemical addition as a basis for improving BPT-level performance. This option would require all coastal discharges of produced water to comply with oil and grease limitations of 29 mg/l monthly average and a daily maximum of 42 mg/l. The technology basis for these limitations is improved operating performance of gas flotation technology. EPA has determined that gas flotation systems could be improved to increase removal efficiencies—*i.e.*, the amount of pollutants removed. Specific mechanisms include proper sizing of the gas flotation unit to improve hydraulic loading (water flow rate through the equipment), adjustment and closer monitoring of engineering parameters such as recycle rate and shear forces that can affect oil droplet size (the smaller the oil droplet, the more difficult the removal), additional maintenance of process equipment, and the addition of chemicals to the gas flotation unit. (See Offshore Technical Development Document Section IX).

The addition of chemicals can be a particularly effective means of increasing the amount of pollutants removed. Because the performance of gas flotation is highly dependent on ''bubble-particle interaction,'' chemicals that enhance that interaction will increase pollutant removal.

Gas flotation is a technology which has been used for many years in treating produced water in the offshore subcategory. In developing final effluent limitations guidelines and standards for the offshore subcategory (58 FR 12454; March 4, 1993), EPA evaluated comments and data submitted by the industry which strongly urged EPA to select improved gas flotation technology as the basis for BAT limits and NSPS, based on an Offshore Operator Committee's (OOC's) 83 Platform Composite Study. Industry further noted that chemical additives would improve the amount of oil and grease in produced water that could be removed. EPA thoroughly reviewed these comments and additional data, and agreed with industry that improved gas flotation should be used as the technology for setting BAT limits and NSPS in the offshore subcategory.

In establishing BAT limits and NSPS for produced water, EPA evaluated the effluent data from the platforms in the 83 Platform Composite Study identified as using improved gas flotation (*e.g.*, use of gravity separators and chemical additives). First, EPA modeled the offshore platform with ''median'' oil and grease effluent values (i.e., 50 percent of the platforms in the database had oil and grease effluent values above (and 50 percent below) the median of the effluent values measured at the median platform. Based on the oil and grease measured at the median platform after improved gas flotation treatment, and allowing for average ''within-platform'' variability, EPA set a daily maximum limit on oil and grease at 42 mg/l, and a 30-day average of 29 mg/l as the BAT limits and NSPS. (See 58 FR 12462, March 4, 1993).

In setting BAT limits and NSPS for the offshore rule, EPA had a choice among several different means of measuring what is termed ''oil and grease'' in produced water, two of which are known as Method 413.1 and Method 503E.

Under Method 413.1, freon is mixed with a sample of produced water. The container is then left at rest to separate the water phase from the freon phase, which includes those contaminants in produced water that dissolve in freon. The freon layer is then drained from the container and distilled by heating, leaving a residue. The residue is then weighed and reported as the weight of the ''oil and grease'' in that sample of produced water. The results are typically reported in milligrams of oil and grease per liter of produced water.

Under Method 503E the same steps are followed, with one exception. After the freon layer is drained from the container, but prior to distillation, silica gel is added to the freon, and weighed. Because the silica gel has the ability to adsorb polar materials (*e.g.*, some of the hydrocarbons and fatty acids present) that otherwise would have been measured as oil and grease in the freon residue by Method 413.1, the analytical result reported under Method 503E is less than that reported under Method 413.1. Because Method 413.1 measures more of the oil and grease in produced water, it gives a more complete picture of the efficiency of the treatment system. Because EPA had influent and effluent data showing that oil and grease, measured under Method 413.1, were removed by the use of improved gas flotation (Oil Content in Produced Brine on Ten Louisiana Production Platforms, September 1981) R.I.G. (No. 194), EPA used improved gas flotation as the technology basis for the rule and established the limitations as measured by Method 413.1 (See also Final Report, Analysis of Oil and Grease Data Associated with Treatment of Produced Water by Gas Flotation Technology, January 13, 1993, and 58 FR 12462, March 4, 1993).

(2) Filtration.

The primary purpose of filtration is to remove suspended matter, including