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Environmental Sound Control for New Power Generation Facilities

The sound control efforts for new power facilities are usually directed toward compliance with the regulatory criteria required to obtain a plant operating license. The greatest probability for success, at the least cost, is achieved by incorporating sound control *early* in the plant design process.

Often, the best approach begins with an analysis of the projected acoustic impact of the proposed plant. This analysis is based on a thorough survey of the proposed site and the surrounding community. Consideration of the sound signatures of the equipment to be installed will determine if the proposed plant will meet sound emission goals. An analytical model can be employed to make design improvements, or to develop specifications for sound control hardware, if necessary.

At the time of plant startup operation, acoustic performance testing may be conducted to determine if sound criteria are met. If a thorough design effort is realized, then the need for remedial sound control measures will be unnecessary. Finally, at the conclusion of a successful sound program, measured sound data are then documented to show compliance in a report for the regulatory authorities.

The sound program can be divided into several phases, or tasks, as follows:

Task 1 -- Initial Site Survey

An initial acoustic survey of the proposed power plant site may be recommended. Measurements are made of the background sound at the site and in the surrounding community, including that from any prominent sound sources external to the site, such as highways or industrial facilities. The most advanced digital data acquisition and storage methods are employed. A series of long term tests (a week or more in duration) and/or a short term test (snap-shot sound samples) may be conducted. This information will often prove useful, both from an engineering design viewpoint and for regulatory licensing purposes.

Task 2 -- Comprehensive Computer Analytical Model

A computer sound prediction model can be developed for a particular power plant project utilizing our extensive data base of source sound signatures for typical equipment, including primary movers. These could include fuel handlers, boilers, draft fans, pumps, gas and steam turbines or reciprocating engines, compressors, coolers, electrical generators and transformers and other ancillary equipment. Also, manufacturer's sound data may be used to develop the computer prediction model.

The effects of plant siting are important for determining sound generation and propagation, as well as operability, maintainability and performance efficiency. In the analytical model, the complex effects of sound source propagation through the atmosphere and over varying terrain are taken into account, arriving at the projected sound levels at nearby sensitive receptor locations.

Environmental Sound Control for New Power Generation Facilities (continued)

Task 3 -- Sound Control Recommendations

Sound reduction strategies, if required, can be developed based on exercising the computer sound prediction model. Once the model has been validated to accurately represent the impact of the plant sound output on a community location, it can be used to calculate the benefits derived at that location due to various sound reduction scenarios. That is, the model can be used to perform a "what-if" analysis of various sound reduction schemes.

These sound reduction scenarios can then be refined until they achieve the desired results. Sound reduction design of the new hardware could be included. This can result in both lower sound and more efficient operation.

Task 4 -- Review Final Plant Design/Installation

The final detailed plant design may be reviewed to ensure adherence to sound control goals. Additionally, supervision of the installation of sound control equipment may be desired.

Task 5 -- Acoustic Performance Test

The acoustic performance of the power plant is measured during a sound survey test at the plant site. Sound measurement locations are selected based on familiarity with sound compliance procedures and any special requirements (sensitive neighbors) specific to the site.

Preliminary data reduction and analysis are performed, on-site if desired, to determine whether the facility meets mandated sound level criteria. Improvement recommendations are then made, if needed. When the preliminary field analysis indicates that compliance is achieved, the final data analysis is conducted in the laboratory. The successful sound survey is then documented in a report for regulatory authorities.

Follow-up Sound Control Program

Should the power plant operation be expanded at some later time, regulatory authorities may mandate that the plant meets updated requirements. Usually, but not always, this means that the expanded plant must not exceed the previous, or "grandfathered", sound emission levels. In this case, sound survey tests on the expanded plant, along with the original sound survey data, are instrumental in gaining regulatory compliance for the expanded operation.