



Project Summary

Model Statewide Compliance Strategy Incorporating the Composite Correction Program (CCP) Concept

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A Composite Correction Program (CCP) identifies causes of performance problems at publicly owned treatment works (POTW's), addresses them systematically and in order of priority of impact on plant capability, and describes solutions to problems. CCP objectives are to improve performance and to bring noncomplying POTW's into compliance. The purposes of this study were to demonstrate the use of the CCP concept on a statewide basis to improve compliance and to develop criteria to incorporate the CCP concept into the State of Colorado's municipal compliance enforcement strategy.

The study selected 16 plants for on-site plant evaluations, typically lasting 3 to 5 days. The major objectives of these comprehensive evaluations were to determine actual compliance status, identify specific factors limiting performance, and assess the potential improvement in performance which could be achieved with a CCP. "Limited" CCP's were initiated at five of the plants which were most suitable for demonstrating the objectives of this project. Limited refers to making minor modifications not involving major construction. Performance was improved during 4 of the 5 CCP's and during 3 of the other 11 comprehensive evaluations.

Through interviews conducted with plant owners, managers, and state pollution control authorities, conclusions were developed regarding the elements that should be considered in the development of an enforcement strat-

egy. These elements then serve as the framework for developing a municipal compliance and enforcement policy and implementation program compatible with most state environmental agencies. The conclusions were:

- Whether a state adopts an official compliance strategy or not, improved performance and increased compliance by municipal plants is unlikely without consistent enforcement efforts by the regulatory agencies.
- Owners of wastewater facilities must be clearly established as the party primarily responsible for methods and funding to achieve required POTW performance and compliance.
- Grant or loan funding programs, including their implementation and administration, should be structured to encourage increased local fiscal responsibility.
- Local administrators should be made aware of the CCP option to improve POTW performance.
- Regulatory agencies must focus on establishing necessary water quality standards and associated individual facility effluent limits, and enforcing these limits.

This Project Summary was developed by EPA's Water Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a

separate report of the same title (see Project Report ordering information in back).

Introduction

In the late 1970's, the U.S. Environmental Protection Agency funded several research projects to identify the problems preventing a large number of publicly owned treatment works (POTW's) from meeting required effluent limits. These studies documented that each facility has a unique combination of limiting factors.

Analysis of the complex interrelationship of varied performance limiting factors together with the ineffectiveness of state and federal programs designed to eliminate these factors led to the development of a unified concept for achieving optimum plant performance. The concept included the identification of performance limiting factors in administration, maintenance, operation, and design; and described how each factor could be individually eliminated, partially eliminated, or left unaddressed by existing programs associated with public wastewater treatment. The concept also related optimum performance to the many performance limiting factors associated with each plant. The correction of only some of the factors limiting performance will not result in the desired improved effluent quality at a particular plant.

The approach for improving plant performance was called a Composite Correction Program (CCP). A CCP is based on optimizing the performance of an existing facility by eliminating problems in administration, design, operation, and maintenance. A major difference between the CCP and many existing programs is that a CCP concentrates on eliminating all factors contributing to poor plant performance at an individual plant, whereas existing programs typically concentrate on specific areas of need representing problems common to a large number of treatment facilities.

Through an EPA cooperative agreement, the Colorado Department of Health (CDH) has demonstrated that the CCP concept can be incorporated into the state's compliance enforcement program and that compliance levels at noncomplying POTW's can be increased. In addition, critical elements of a compliance strategy that incorporates the CCP have been identified and the framework of a model enforcement program has been developed.

Procedure

A selection procedure was used to determine the Colorado POTW's used as demonstration facilities for CCP's. The selection process involved two major steps of screening: in-office screening using previously developed data and in-plant evaluations of selected facilities by the contractor.

In-office screening was accomplished as a joint effort between the contractor, CDH personnel, and EPA Region VIII personnel. Compliance and inspection report information was supplemented with personal knowledge of facilities to identify those POTW's most suitable for implementing CCP's. State district engineers were consulted regarding some facilities and were asked to suggest additional possible facilities. Key considerations in selecting POTW's for the in-plant evaluations were mechanical/biological plant; noncompliance with respect to BOD₅, TSS, and fecal coliform parameter regulations; and absence of construction activity.

Upon evaluation, the plants were given a classification of Type I through Type IV:

Type I—Complying with effluent requirements.

Type II—Non-compliance (enforceable documentation).

Type III—Marginally out of compliance.

Type IV—Performance suspect.

The 16 treatment facilities in the Type II through Type IV categories were selected for the in-plant performance evaluation, termed "Comprehensive Evaluation" (CE). A formal request for each facility's involvement in the CCP project was accomplished through a letter sent by CDH to each facility administrator. The letters explained the scope of the project; however, the wording of each letter varied depending on the plant type (i.e., II, III, IV).

After the letters were sent, each owner was contacted by the contractor to establish a time to conduct a comprehensive evaluation. Comprehensive evaluations were typically conducted by two operations engineers over a 3- to 5-day period. The initial step of each evaluation was a meeting between the evaluation team and the facility administrators. The purpose of the interviews was to improve local understanding of the project and its consequences, evaluate administrators' knowledge of the treatment plant and its status, and as-

sess the owners' attitudes on plant compliance and regulatory agency roles.

The in-plant work at each facility identified factors limiting performance and evaluated the performance potential of those facilities. Discussions with the staff were used to document existing operation and maintenance procedures. The existing loadings on treatment processes were obtained through field measurements and a review of plant records and drawings. Based on this information, a performance potential table was developed that provided an estimated capacity for each treatment process. Each report classified the subject facility according to the potential for improving performance using a CCP limited to the scope available within the project. Each facility evaluated was classified according to the following:

Type A - Permit compliance with final limits can be achieved by conducting a CCP without major capital improvements.

Type B - Significantly improved performance can be achieved with a CCP, but consistent compliance with final limits is not likely without a major upgrade.

Type C - Significantly improved performance would not result from a CCP.

Composite Correction Programs were conducted at five treatment facilities. The length of the CCP's ranged from 4 months to 12 months. Each CCP was carried out by the project personnel who had conducted the respective comprehensive evaluation.

The CCP's were implemented using periodic onsite and telephone consultations between the contractor and the facility staff. The major factors limiting performance, which had been identified in the comprehensive evaluation, were initially addressed in the CCP. The CCP emphasis was to eliminate factors limiting performance until desired effluent quality was achieved. Necessary modifications to plant operation and design required a coordinated effort among the contractor, the owner, and, in some cases, the owner's engineer. At some plants, recommended operational modifications (e.g., sludge hauling) would have been financially restrictive for the owner and impossible to fund within the time frame of the research study. In these cases, less costly methods of accomplishing the same result were in-

vestigated and implemented if feasible. For this demonstration project, the CCP was considered successful and complete when the desired effluent quality was maintained for 4 consecutive months.

Based on a point scoring system that assigns values related to the extent of adverse impact, the highest ranking factors collectively identified at plants in this study are listed in Table 1. Of the 16 facilities evaluated, 10 were activated sludge facilities, 5 used trickling filters, and 1 was an aerated lagoon. Highest ranking factors for the activated sludge and the trickling filter facilities were calculated individually. The top ranking factors limiting performance were very similar for these two categories of facilities.

The top ranking factors limiting performance illustrate the complexity of most problems limiting wastewater plant performance. Inadequacies in the areas of sludge treatment and disposal, aerators, clarifiers, disinfection, process flexibility, and process return streams all indicate that design limitations exist in the plants studied. Poor operator application of concepts and testing indicates that many plants could improve operation by application of process control principles. In addition, plant administrators' unfamiliarity with plant needs and the dissemination of improper technical guidance by "authoritative sources" also limit the potential of existing facilities. The most obvious conclusion drawn from analyzing the top factors limiting performance is that no single group—operators, engineers or administrators—is responsible for the problems. Improved performance at any one facility requires that all individuals focus on that common goal.

Performance associated with the CCP's in the Colorado project is summarized in Table 2. In the comprehensive evaluations preceding each CCP, the performance level expected from a limited CCP was predicted. In this study, a limited CCP was initiated at selected plants to demonstrate improved performance with existing facilities. This contrasts with the originally developed total CCP concept, which includes all plant modifications or additions, onsite training to improve operator capabilities, and extended onsite- and telephone-consultation to monitor and fine-tune process performance.

All five facilities were routinely out of compliance at the time of the compre-

Table 1. Combined Ranking of Factors Limiting Performance

Rank	Factor	Total Points
1	Ultimate Sludge Disposal	24
1	Operator Application of Concepts and Testing to Process Control	24
3	Aerator	16
4	Infiltration/Inflow	14
5	Clarifier	13
6	Improper Technical Guidance	11
7	Disinfection	9
8	Administration Familiarity with Plant Needs	8
8	Sludge Treatment	8
10	Return Process Streams	7
10	Process Flexibility	7

Table 2. Performance Predicted and Achieved

Facility	Long Term Performance Predicted from CE	Actual Improvement Achieved within 4 months
Brighton	Improved but not to secondary	Improved but not to secondary
Morrison	Improved Performance Final limits, 30/30	Improved Performance Final Limits
Littleton/Englewood	Improved Performance Final limits, 20/20	Improved Performance Not Final limits
Montrose	Improved but not to secondary	No improvement
Idaho Springs	Meet interim, 50/50 Meet final, 30/30 half time	Improved Performance Meet Interim Not 30/30 half time

hensive evaluations. It was predicted that two of the facilities could be brought into compliance with final limits by using the proposed CCP. At the other three plants, improvements in performance but not compliance with final limits could be expected. At three additional plants where limited CCP's were started, the additional work revealed previously undetectable problems requiring modifications more extensive than originally estimated for the plants to meet final limits. Therefore, these CCP's were terminated. These results illustrate the findings of the original research that led to the development of the CCP concept: to cost-effectively improve performance in a wastewater facility, any and all factors that limit performance must be systematically addressed and eliminated until the desired performance level is achieved. Based on the Colorado demonstration project results, it appears that the level of effort predetermined by the comprehensive

plant evaluation will be successful in improving performance at some plants but will be inadequate in other plants.

As shown in Table 2, performance was improved in four of the facilities, but not always to the levels predicted in the comprehensive plant evaluations. Specific circumstances were discussed in the individual CCP reports. In general, the factors limiting plant performance were correctly identified in the comprehensive evaluations, but project time and budget constraints limited the factors that could be adequately addressed by the limited CCP's in this project.

The results further point out that, although the plant performance evaluations are comprehensive, a CE alone will not always accurately predict the extent of corrections required. From previous applications of the CE/CCP process, additional problems and new priorities are generally found during the CCP activities. These are found only after corrections are made and would

not have come to light without correcting and eliminating the original or more obvious problems. Because the CE/CCP is a continuing effort of discovery, it is clear that commitment by plant administration to only a predetermined list of plant improvements (i.e., a limited CCP) will likely produce only limited improvements in performance and possible failure to achieve the goal of compliance.

The costs associated with plant evaluations and the implementation of a CCP would generally be incurred by individual communities. It is not intended that the state assume the responsibility for meeting the long-term wastewater treatment needs of selected communities. The CCP costs that would ordinarily have been incurred by the respective communities in this study are shown in Table 3. The expenses were limited to those necessary to demonstrate improved performance by maximizing effectiveness of the existing facilities. The

costs did not include those that would be incurred when plant modifications or additions, long-term operator training, and all improvements required to achieve the performance and compliance goals are made.

Municipalities' Views on Compliance

Interviews were held with cognizant city and treatment plant personnel at the 16 facilities where CE's were completed regarding the conduct of comprehensive plant evaluations and the implementation of CCP's. It was concluded that there is little incentive to improve the performance of existing plants because of the possibility of receiving Federal grant funding.

Administrators who represented the facility owners were interviewed twice during each comprehensive evaluation: once prior to the evaluation, and once at the end. These interviews were used to

discuss such things as responsibilities, priorities, regulatory agencies, and the current plant status, as well as the intentions and results of the facility evaluations. Administrative responses obtained during the interviews are summarized as follows:

- All administrators felt some responsibility for their plant. Their assessment of whether or not they met that responsibility usually was not directly related to plant performance.
- Minimizing local costs and obtaining Federal grants were generally viewed as the best ways administrators could meet their overall responsibility.
- Most administrators of plants not in compliance believed they could not comply without a grant.
- Sampling and reporting in at least two cities was according to permit, but not representative of true performance.
- Enforcement activities dramatically increased administrators' awareness of plant performance.
- Local administrators believe CDH's primary role is to provide assistance to the local community. Local administrators do not recognize that the Department's ultimate responsibility is for overall protection of Colorado waters.
- Strong continued enforcement action by the State of Colorado provided the incentive for one community to replace personnel in positions as high as the Director of Public Works. Continuous compliance resulted and wastewater treatment is now operated as a self-supporting utility.

Enforcement Strategy: Key Elements

Encouraged by the demonstrated improved performance possibilities and the potential cost savings when a clear focus on achieving required effluent quality is pursued, a compliance strategy framework was developed. The strategy conceptually outlines activities required to overcome the observed roadblocks for owners/administrators and regulatory agency personnel.

Key elements which define specific points of view for consideration and adoption by a federal, state or other areawide governing body (i.e., county or regional council of governments) are presented. Procedural requirements

Table 3. CCP Costs

	Estimated Cost of CCP	Actual Cost of "Limited" CCP
Morrison		
CCP Consultant	\$ 8,900	\$ 5,200
Other Costs	<u>12,420</u>	<u>8,325</u>
TOTAL	\$ 21,320*	\$13,525
Idaho Springs		
CCP Consultant	\$ 8,000	\$ 4,400
Other Costs	11,900 <u>175,000[†]</u>	<u>15,600</u>
TOTAL	\$194,900*	\$20,000
Littleton/Englewood		
CCP Consultant	\$ 84,000	\$9,180 expended prior
Other Costs	<u>78,000</u>	to termination of this CCP
TOTAL	\$162,000*	
Montrose		
CCP Consultant	\$ 9,000	\$ 3,700
Other Costs	<u>12,000</u>	<u>20,700</u>
TOTAL	\$ 21,000*	\$24,400
Brighton		
CCP Consultant	\$ 9,800	\$ 5,000
Other Costs	<u>23,300</u>	<u>4,525</u>
TOTAL	\$ 33,100*	\$ 9,525

**"Limited" CCP

[†]Cost of modifications completed by the City prior to and during the CCP.

*Full CCP

and party responsibility for action are identified for development of a compliance strategy which accommodates the research conclusions. The recommendations are not all-inclusive but instead demonstrate the method of factoring the research conclusions into specific day-to-day activities. It is believed that compilation of these specific actions will lead to improved local and area-wide compliance at municipal wastewater treatment plants.

Although the key elements developed represent activities for a regulatory agency, factoring the specific activities of facility owners, consultants, operators, and others into the strategy framework could also be considered.

Regulatory agencies must clearly demonstrate a willingness to pursue aggressive enforcement of effluent compliance. In doing so, regulatory agencies best direct owners/administrators by clearly focusing the attention of local officials on their responsibility for achieving required effluent quality. However, effective enforcement requires establishment of reasonable water quality standards upon which effluent standards can be based; standards that result in a clear target for local officials. Enforcement or the threat of enforcement by a state agency for a local facility to achieve effluent compliance provides the "outside authority" that acts on behalf of the general public's interest to protect overall water quality. The outside incentive is necessary so that local officials may achieve required performance by increasing priority and funding commitment on a local basis.

Regulatory agencies have difficulty offering technical and operational assistance to individual communities while providing effective motivational enforcement. Providing assistance interferes with establishing owners and administrators as the party responsible for plant performance. If a state chooses to provide assistance to individual communities, the efforts must be clearly separated from the regulatory function. An understanding between the local community and the state assistance personnel must be reached concerning responsibility for the plant's effluent quality.

Focusing local priorities on achieving adequate treatment must be supplemented by awareness of a need for increased local financial responsibility.

Consistent enforcement pressure plus increased local responsibility would encourage local officials to develop a self-sustaining utility approach toward meeting their wastewater treatment responsibilities. Desired plant performance can be achieved despite reduced grant support. Technical personnel can become adept at achieving compliance with existing facilities so that large capital improvement projects would only be implemented when truly necessary.

Key elements necessary to encourage this outcome are aggressive enforcement focused on effluent compliance coupled with an emphasis on local responsibility for plant performance and compliance.

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The complete report entitled "Model Statewide Compliance Strategy Incorporating the Composite Correction Program (CCP) Concept," (Order No. PB 87-181 418/AS; Cost: \$18.95, subject to change) will be available only from:

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