THE ENGINEER BECOMES A PROFESSIONAL MANAGER

HARRY RUBEY • Professor of Civil Engineering

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Inquiries regarding these matters should be addressed to

The Director,
Engineering Experiment Station
University of Missouri
Columbia, Missouri
The Engineer Becomes a Professional Manager*

By HARRY RUBEY
Professor and Chairman, Department of Civil Engineering, University of Missouri

Introduction

This Centennial is a well deserved tribute to the achievements of the engineer and to his application of science to the material welfare of mankind. The general public is beginning to realize that the engineer's universally accepted technology is the real basis for modern industry, high living standards, and national security—not the controversial political and economic nostrums which are dinned into our ears.

However, too little has been said or is generally known of the equally great contribution which the engineer has made to modern management. Beginning with Taylor, Gantt, Emerson, and their associates who originated and developed scientific management and mass production at the turn of the Century, engineers have extended their attainments and mastery to all phases of management, often at the highest levels.

Today over a third of the management of large industry in America is in the hands of engineers, over a third of mature engineering graduates now find their duties largely managerial in nature, and most engineers have important contacts with management. Management has recently become a profession into which the engineer now has preferred entree.

May I briefly summarize and document some of the evidence on this development which is unknown to the general public and too little known to engineers and engineering educators themselves. Even so comprehensive a program as that of this Centennial gives little attention to the engineer's outstanding contribution to management.

Recent Studies of Engineers in Management

Professor W. L. Warner, well recognized sociologist of the University of Chicago says in his recent book, "Social Class in America," "More and more top jobs in industry are being filled by men coming up from technical engineering schools and universities. The route up then is no longer through a hierarchy of increasing skill as it was two generations ago. The prudent mobile man today must prepare himself by education. . . . In this age of technical wizardry and large scale industry, the most prudent man will master a field like engineering or business administration to gain a maximum chance at promotion to the inner circles of management and planning."

Engineers' Joint Council Report. The most comprehensive statistics available on the engineering profession are given in a report entitled "The Engineering Profession in Transition," 1947. It shows 34 per cent of those questioned (38,000 members of six principal national engineering societies) doing work which is primarily administrative in nature. In another report the Council states "... management is clearly becoming professional in function. Engineers, as the most numerous and influential professional group in industry, are exceptionally placed to capitalize on this opportunity."

Vice-President Walter Evans of Westinghouse Electric Company has said:

"With mass production the engineer came into his own. As industry became
more complex, the engineer who understood what was happening joined the lawyers and bankers in administrative positions, because industry had new problems which only the engineer could solve.

"... during the last decade engineers have begun crowding the bankers and lawyers in this contest for high-level administrative posts. ..."

"A dramatic example of how successful the engineer has been is found in a survey conducted by Earle B. Norris, dean of the School of Engineering at the Virginia Polytechnic Institute, which showed that one-third of the largest corporations in America—50 out of 150—are headed by graduate engineers. ..."

"In looking at the results of this survey it becomes even more significant when we realize that there are 1,600 liberal arts and teachers' colleges compared to 160 engineering colleges.

"Among the engineers already distinguishing themselves in such posts are: Cleo F. Craig, president of the American Telephone and Telegraph Company; Benjamin F. Fairless, president and chairman of the board of United States Steel Corporation; Eugene G. Grace, chairman of the board of Bethlehem Steel; Charles Erwin Wilson, president of General Motors; and Crawford H. Greenewalt, president of E. I. du Pont."

Rensselaer Polytechnic Institute questioned 561 executives of large industries in 1949 with the following findings:

1. Ninety per cent see a growing demand in business and industry for executives and managers who have a background in engineering.

2. Approximately thirty-nine per cent of the executive and managerial positions in the industries represented by respondents to the survey are now held by graduates of colleges of engineering.

"Time Magazine Research Report No. 1069, May 1950, summarized the answers to the questionnaire sent one-sixth of those listed in "Who's Who in Engineering," Seven per cent are corporate presidents, and an additional sixteen per cent are in other top executive positions. Thirty-five per cent are managers, chief engineers, and department heads while forty-two per cent are specialists and consultants.

Sixty-three per cent of these engineers checked administration, finance, and management as areas in which they have occupational responsibilities.

Because many management engineers are not listed in Who's Who in Engineering nor are they members of their national professional societies, the percentages of engineers engaged in management as reported by Time and by Engineers' Joint Council are doubtless low.

The American Society for Engineering Education, in a 1951 pamphlet, states, "A careful study of the number of engineering graduates who hold executive positions in industry has shown that engineers have from 10 to 20 times the probability of attaining executive positions as compared with all other college graduates."

General Motors, in a broadcast over ABC on November 26, 1951, stated in part:

"Tonight, I just want to conclude this assembly of three broadcasts in this investigation by pointing out the amazingly widespread climb of engineering-qualified students to the top, as general executives, in American enterprises—in short, the enormous individual possibilities in this opportunity, based on the record.

"According to a Columbia University survey, and I quote, I find that 'forty per cent of industrial management is engineer-trained, replacing both the lawyer and the banker in top industrial posts.'

"Look at some of the top management in our country, men with great general responsibilities. I think you would be amazed to realize how many got their training as engineers—thus trained to think precisely, trained in human values, trained to apply constructive imagination and decision.

"Largely at random, and among diversified and notable American enterprises, I've been asking questions: 'How
many of your top executives trained themselves as engineers? This is what I found:

"I spoke last week of Bethlehem Steel, and the head of that company, who is an engineer, graduated from Lehigh.

"The president of United States Steel, having some 308,000 employees all over the world, started as an engineer, a civil engineer, graduated from Ohio Northern University. There are 13 Presidents of the United States Steel Company's subsidiary companies who started as engineers.

"There are 20 Presidents of associated companies in the great Bell Telephone System. Of these I find 10 graduated as engineers. In the parent A T & T, over half the men who are Vice-Presidents started as engineers and advanced to the broadest duties in the business.

"Fourteen members on the Board of Directors of the Standard Oil Company of New Jersey are engineers. The Chairman of the Board in this great worldwide enterprise is an engineer, graduated from Syracuse University.

"At least 15 top executives of Anaconda Copper and its major subsidiaries are graduate engineers. Over half the Vice-Presidents and 90% of the top executives in the five divisions of Union Carbide started up the ladder as engineers.

"Nearly half the top officials of the General Electric Company started as engineers. In fact, the Chairman of the Board was first graduated as an engineer at the University of Wisconsin and studied law as well. And, as you may know, Mr. C. E. Wilson, lately the nation's mobilization chief, while not a graduate engineer, was technically trained at the Mechanics' Institute in New York and, among other duties, he advanced through G. E.'s Engineering Department.

"The Chairman of the Board of RCA completed special engineering night courses at Pratt Institute and 8 of the Vice-Presidents got their executive training as engineers.

"The Chairman of the Board of Directors of General Motors is an engineer, graduated from M. I. T. The President of General Motors is an engineer, graduated from Carnegie Institute. One of the four Executive Vice-Presidents is an engineer, graduated from the University of Illinois. Sixteen of the Corporation's Vice-Presidents are engineers. As a matter of fact, there are sixteen members of the Board of Directors of General Motors who are engineers.

"Now, there's time to cite only some of these findings, but such sample cases as I found simply support the over-all findings of the Columbia University survey, namely—and may I repeat—that forty per cent of industrial management today is engineer-trained, replacing both the lawyer and the banker in top industrial posts. I think there's news in that."

President Gurley of the Santa Fe Lines said at the A.R.E.A. meeting last March, "No longer can engineers confine their activities to design, construction, and maintenance. Theirs must be a broader outlook. Both management and the engineers themselves have mistaken concepts of where the engineer fits into the picture. Engineers should concern themselves more with administration. Their logical technological reasoning can help improve the economical operation of the railroads, reduce the damage to property being shipped, and develop more revenue-paying business now going to competitive forms of transportation." It will be noted that President Gurley indicates new activities beyond those traditional to railroad engineering.

Herbert Hoover even more recently has written, in connection with this Centennial, "In the gigantic field of applied science, the trained engineer is now emerging into the executive field. It is said that the heads of more than one-half of the great productive corporations are trained engineers."

Conclusion

So while at this Centennial we honor the engineer for his technology, we should
honor him equally for his contribution to management.

The data presented earlier in this paper prove that an engineering education is a good preparation for positions in top management, but it does not follow that the same large proportion of engineering students of today will be among the top executives of the next generation. When the older top executives were starting their careers, they had little competition from the graduates of schools of business administration. That is not the case today. In fact, many of the larger manufacturing companies will freely admit that they find business administration graduates more interested in, and more easily trained for, general management positions than are engineering graduates.

The conditions I have just described are so bad that according to the National Society of Professional Engineers, two-thirds of industrial concerns make no effort to tell their engineers of management openings. Fortunately, young engineering graduates who realize the importance to themselves of a knowledge of management principles, and who show their employers that they are interested, have at least as good an opportunity to enter the management side of industry as did the engineers of the earlier generation.

Only a few engineering students can afford the time required for the detailed and specialized courses in industrial engineering curricula, but all engineering students can afford the small amount of time needed to introduce them to the fundamentals of management. This also will show them that they should continue to study these fundamentals during their early years after graduation when management problems will surround them, although in most cases they will not be asked to assist in their solution.

While many engineers will not function as managers, yet the higher types of professional engineers must understand and cooperate with management.

A promising movement for our country lies in that new profession of management, largely practiced by engineers, which is motivated by a drive to make man's work effective rather than by the older drives for financial or political power. With professional management and technology, America's future is assured. Other national policies and procedures then will trend naturally into desirable patterns.

Unless engineers and engineering educators seize and answer this call to leadership, others will grasp and exploit it. Then the engineering profession, engineering education, and industry will have missed a great opportunity. As a final thought, if more engineering graduates become managers, then more support for engineering education will be forthcoming.
PUBLICATIONS OF THE ENGINEERING REPRINT SERIES

Reprint No.


*2. Heat Transfer to Water Boiling Under Pressure, by E. A. Farber, Graduate Student, now Assistant Professor of Mechanical Engineering, University of Wisconsin, and R. L. Scorah, Professor of Mechanical Engineering. Reprinted from The Transactions of The A. S. M. E., May 1948.


*Out of Print