

PRODUCTION**Industry Seeks Its Own Radio Net**

● Oil and gas companies, utilities, and railroads find they often can handle their own communications more cheaply and reliably by microwave radio than by leased wires.

● The rise of data-processing centers and automatic operation of such things as remote compressor stations is vastly increasing industry's communications load.

● FCC nears a showdown decision over dividing radio channels between industry and phone companies.

Columbia Gas System, Inc., is about to spend \$250,000 on a 1,500-mi. private radio network, using microwave relay, to solve its internal communications problem.

Microwave relay is a relatively new technique that beams ultra high frequency transmissions along a series of short-range radio repeater stations.

Companies in the oil and gas production and distribution industry already operate about one-third of the private point-to-point microwave hookups—the rest is shared among state and municipal services, railroads, utilities, and radio-TV stations for local use. Probably the most extensive private user of microwave communication is Transcontinental Gas Pipe Line Corp., which operates a 1,800-mi. system between Houston and New York.

• **Legal Fuss**—The mechanics of microwave communication have been worked out pretty thoroughly, as Columbia's decision attests, but the economics and legalities haven't. That's why industrial use of the method has been virtually restricted to railroads, utilities, and pipeline companies, even though many other companies show interest in adopting it.

Right now, microwave systems other than those used by telephone and telegraph companies—the common carriers—operate on renewable developmental permits good for only one year. But soon, possibly by midyear, the Federal Communications Commission is expected to rule on permanent licenses for industrial and service microwave systems. It will also have to decide whether or not to open some microwave channels for general industrial use on either a permanent or developmental basis.

Both industrial representatives and spokesmen for the communications common carriers have presented reams of testimony on the question to the FCC hearings labelled Docket 11866,

which deals with allocations of frequencies in the microwave region—above 890 megacycles. The hearings, which opened in 1957, were closed last November. No one can predict what the FCC decision will be, nor when it will be issued. The arguments are long and involved, but they fall generally into two camps—general industry vs. the common carriers.

• **Two Sides**—Industrial representatives ask for permanent allocation of some frequency bands on the basis that there is a demonstrable need for faster, cheaper and better communication systems—particularly for data processing, specialized services such as facsimile, and remote control. These, they say, are too expensive to consider if common carrier tariffs apply.

Also, most industry representatives claim they need full control over their systems to insure reliability and to permit complete freedom for experimentation and development of new techniques. They insist that they can get such control only through private ownership of their communications links.

On the other hand, the common carriers claim that permanent allocation of frequencies for private use would divert broadcasting space, a valuable and limited public resource, to private operators so there is no guarantee that it would best serve the general public. It makes more sense, common carriers say, to centralize responsibility for service under one authority that is obligated by law to serve all comers.

The common carriers also view private microwave as a threat to some of their most lucrative business. Bell System spokesmen have testified that if industrial communications were diverted from high-density routes, the system would be forced to readjust its entire rate structure, since heavy traffic routes bear a large part of the burden for maintaining unprofitable low-traffic lines.

• **Precedent Helps**—Both sides have

compelling cases. But until the FCC decides, no one knows where the line will be drawn between private microwave and the telephone companies.

However, right-of-way companies like Columbia, who have a long history of operating their own systems, feel that precedent is so strongly on their side that there is virtually no likelihood that their applications for permanent operating licenses on microwave frequencies will be denied.

I. One Company's Saving

Columbia Gas will make its first expansion of microwave communication not out on the remote reaches of its long-haul pipelines but in its seven-state distribution system, in the highly industrialized home grounds of the phone companies. The company has concluded, after more than two years of experimenting with a 96-mi. microwave relay hookup, that—where the communications load is heavy—radio is cheaper than private cable or wire, even cheaper than leasing wires from telephone companies.

• **A Lot of Talk**—A fuel gas distribution system is much like a big chemical process plant or a refinery—its control problems are chiefly those of metering and regulating flow. But this plant, instead of being concentrated in a few acres, is spread over many states.

It takes a lot of talk along Columbia's system to coordinate the process, and a lot of meter reading has to be reported to central points. Columbia's facilities stretch from Lafayette, La., to the Hudson Valley at Nyack, N. Y., and from Toledo to Washington, D. C., in the other direction. The company produces some of its gas, buys the rest. In its seven-state distribution area, it delivers to 2,000 wholesale customers—mostly local utilities—and to 1.3-million retail customers. Annual sales top \$375-million.

Columbia's communications problem includes not only continuous supervision of the pipelines from Louisiana but also uninterrupted contact with hundreds of widely scattered compressor stations, pipe junctions, metering stations, underground reservoirs, pressure-regulating stations, and quality check points.

• **Private Lines**—To handle this traffic within the company and dealings with the customers, Columbia has built up a private communications network that's bigger than some of the telephone companies it deals with.

In this system are 1,500 mi. of private

pole lines, 1,800 mi. of wire circuits capable of carrying single messages, and 2,172 mi. of four-channel telephone wires, plus nearly 3,000 mi. of telephone circuits leased from Bell System subsidiaries and several hundred independent phone companies.

Columbia also operates 138 base radio stations that talk to 1,346 mobile radio units. Finally, it has its 96-mi. experimental microwave setup, which can carry 24 voice channels simultaneously.

• **New Type of Load**—Most of this communications plant was designed for carrying the voice, but the load of electronic signals from data-processing machines and from remote controls has been increasing fast.

Many important meters are read and valves controlled directly at the main office these days; entire compressor stations are operated from control rooms miles away. Private radio bases have been converted to automatic, unattended operation, often on mountain tops for best sending and receiving. Columbia has also centralized all its billing and accounting at its data-processing center in Charleston, W. Va.

Each step toward centralized control increases the load on communications—and particularly on its reliability. A pole line in the mountains, for example, can't be trusted to run a critical compressor station. It's too exposed to breaking by snow, ice, or falling trees. Yet an underground cable would cost too much. Moreover, in case of widespread damage such as that in hurricanes or severe ice storms, Columbia insists it sometimes takes weeks before low-priority leased wires are restored by the phone companies.

• **Reliable Radio**—Reliability was one goal when Columbia installed its present microwave network in 1956. The system, though an "early model," has operated from the start at better than 99% availability, says R. W. Stewart, Columbia's director of communications.

"Since we got that system," says Stewart, "the manufacturers have made all kinds of improvements, and we expect even better performance from the installations we're planning."

• **Money-Saver**—Stewart expects microwave to yield substantial savings as the communications load increases. According to a study by him and men from each of Columbia's operating groups, private microwave can beat the cost of leased wires wherever a route requires more than seven voice channels. At 20 circuits, Columbia says its cost will be only one-third to one-half the toll for leased wires.

H. A. Rhodes, Transcontinental's superintendent of communications, goes even further in favoring microwave. He says the breakeven point between micro-

wave and leased wires is only three voice channels. "If we paid common carrier rates for the service we provide ourselves," he declares, "it would break us, and the service wouldn't be as good."

"The economic case is plain," Stewart agrees, "but I'd say it actually isn't our primary interest at this point. We are most concerned about reliability and room for future growth."

• **First Expansion Step**—This year, Columbia's microwave network will link Charleston, W. Va., with Pittsburgh and Columbus. Later it will be extended to New York, Washington, Cincinnati, and other operating centers. The company has no plans to extend it to Louisiana, where leased wires don't carry a heavy enough load today to justify a multi-channel microwave hookup.

At the start, it will cost Columbia slightly more to operate the Charleston-Pittsburgh-Columbus microwave net than it would to expand the capacity of the present mixture of private and leased wires—about \$219,000 a year compared with around \$209,000. But Columbia estimates a saving when it expands capacity in this area by 1965—an annual cost of less than \$260,000 for microwave, compared with \$350,000 for wires.

II. Potential Users

The Bell System has no disagreement with the economy of microwave radio relay as a technique. It operates more than 19-million circuit mi. of such service for long-distance telephone, and credits these facilities with keeping toll rates down in a time of otherwise rising costs.

With every step toward centralized data processing, industry shows more interest in private microwave operation. Manufacturers, insurance companies, and others with a heavy load of paperwork would like to use this ultra high frequency radio to funnel data to computers from an area large enough to justify the expense of the equipment. There are other industrial uses, too: the high-speed facsimile transmission of work orders and engineering drawings, the sending of production schedule details and up-to-the-minute data on inventories.

• **Candidates**—Bell System and other common carriers aren't sitting quietly while their industrial customers put microwave to work on their busiest communications routes. Bell generally withholds protest against the granting of development licenses to right-of-way companies such as railroads and pipelines. But it opposes applications from other companies.

Last year, Minute Maid Corp. applied for one of the temporary permits, but was turned down by FCC. Chrysler

Corp. has made a study of a private microwave net, but it hasn't applied formally for a permit.

A hot battle is going on between the Bell System and the American Trucking Assn. over an FCC application of Central Freight Lines for an experimental microwave hookup between Dallas and Fort Worth. The trucking line says it wants to experiment with improved methods of data-handling, particularly facsimile transmission of bills of lading. It says Southwestern Bell cannot provide the service at reasonable cost.

III. Economics Issue

By definition, when a company like Columbia Gas puts in its own radio service, a phone company loses some of its most profitable, high-density traffic. Bell calls it "skimming the cream" and warns that a further spread of the practice could leave the phone companies with nothing but low-volume, high-cost service. This, few industrial applicants for microwave will deny.

"But," says one oil company spokesman, "does this mean I shouldn't be allowed to drive my car wherever there is a bus line or a railroad because they lose my fare?"

• **The Service Case**—The argument that all available microwave frequencies should be allotted to common carriers on the ground that they are best able to serve all the public is no simpler. Many industrial users—and would-be users—contend that there is more than enough room in the microwave region for both common carriers and private systems. Their contention is based on the technically different nature of microwave, compared with other types of broadcasting.

Microwave can be transmitted only from horizon to horizon except in very special instances; and transmissions can be focused like the beam of a spotlight. Thus, many broadcasters can operate simultaneously in the same area on the same frequency, as long as their beams don't coincide. Moreover, equipment manufacturers say relatively few areas of the country are in danger of overcrowding the high-frequency channels.

With industry and common carrier participation in microwave broadcasting at stake, the FCC's decision on Docket 11866 could be one of the most important in the history of broadcasting. Whether the agency decides to expand allotments to industrial users for private communications or not, the right-of-way companies and public utilities who are already operating under temporary permits are confident they will get permanent licenses. And they are even more confident that their use of microwave will continue to expand.