Technical-Professional

ACHIEVEMENTS

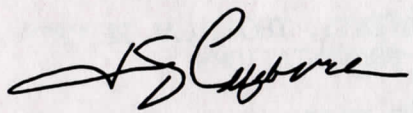
Highlights of the 1977
Efforts of Omaha Works
Technical-Professional
Personnel

Index

This past year, you, the Technical-Professional Staff at the Omaha Works, again met the unique challenges brought about by our rapidly changing product line. In 1977, you made great strides in the transformation of the Omaha Works from a facility for manufacturing crossbar switching equipment to one of the Company's principal producers of cable and wire products and loop transmission apparatus. Primarily through your efforts, phasing down of crossbar wired equipment manufacturing is near completion and it is rapidly being replaced by an expanding line of loop transmission apparatus.

It is largely due to your professional ability, resourcefulness, and creativity that the Omaha Works is a high-quality, low-cost producer of the cable, wire, and LTA so important to the operating telephone companies in meeting the nation's demand for telecommunications. It is through the continued dedication of Technical-Professional people like yourselves to improve quality and reduce costs that the Omaha Works will keep ahead of our competition in satisfying the needs of the communications industry throughout the world.

I look forward to 1978 with confidence, secure in the knowledge that you, the members of the Technical-Professional Staff, will energetically contribute as you always have toward keeping the Omaha Works viable in this highly competitive and rapidly changing business.

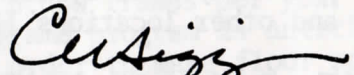


F. J. LEFEBVRE
General Manager

This is the third time that a booklet has been issued highlighting some of the many achievements of the Omaha Works Technical-Professional Staff. I regret that limited time and facilities make it impossible to include all the technical projects completed throughout 1977. I know that every project successfully completed not only represents a personal triumph, but it also contributes significantly to the success of the Omaha Works.

I will add my copy of this booklet to those from past years. It will serve, as have the others, to keep me aware of the excellence of our Technical-Professional employees and of their important contributions.

My sincere congratulations to all of you; 1977 was an outstanding year of technical achievements.



C. L. HIGGINSON
Director of Engineering
and Manufacturing

Product Display Center

The Omaha Works Product Display Center was created in 1976 to provide a special place in which to display our products to Telephone Company and other Bell System personnel.

The number of people who visited the LTA Product Display Center during 1977 tripled compared to the number visiting in 1976. A total of 866 persons visited the Center last year compared to 284 in 1976.

Recorded visits to the Center averaged at least one per week in 1977; that is, on 87 different occasions, visitors viewed presentations in the Display Center and took shop tours.

Of the 866 persons who came to the Center, 346 were representatives of Bell System operating telephone companies (117 in 1976) and the remaining 520 were primarily Bell System employees from the Omaha Works and other locations (167 in 1976).

The Product Display Center and its use continues to be a key factor in the development of a more "market conscious" attitude on the part of all employees at Omaha.

Switching Products

Omaha's transfer into the Cable and Wire Division effective January 1, 1977, was the final signal that additional switching products would be consolidated at other locations to make floor space available for products of the new division. The program for all Omaha switching products except miniature wire spring relays was at a lower level in 1977. The miniature wire spring relay program increased to meet demands for ESS and transmission applications. Capacity will increase from 3.0 to 3.5 million relays in 1978.

The switching products that will remain in Omaha are miniature wire spring relays, MC relays, No. 4 crossbar plug-in trunks, electronic timers, and large and small crossbar switches.

To reduce the frame capacity to zero, BCA 460H--authorizing the reduction of crossbar frame capacity from 16,000 to 6,000 frames per year--is being reissued. No frame program is anticipated after April 1, 1978, in order to make floor space available for loading coil manufacture. Non-x unit manufacture will continue at least until the end of June when this floor space also will be released to loading coil manufacture.

SCA 2527 authorized disposal of facilities for the manufacture of GP wire spring relays. Omaha GP relay manufacture was completed November 11, 1977, and all facilities were removed by year-end. MC relay facilities are being consolidated to make contiguous floor space available for new Cable and Wire Division products.

Consolidation and relocation of other switching products are discussed in subsequent paragraphs.

CONSOLIDATION OF CROSSBAR SWITCHES

As requirements for crossbar switches have decreased, engineering effort has been focused on reducing capacity and consolidating operations. During 1977, standard and small crossbar switches were consolidated, releasing approximately 15,000 square feet of floor space for new products. Work is continuing to reduce capacities from the present 225,000 switches per year to 120,000 switches annually with a goal of releasing an additional 15,000 square feet in conjunction with relay piece part manufacture consolidation.

Reductions in switch costs, as well as capacity, also were evident with the introduction of new multiple strapping technology, the installation of a multlead laser welder, and improvements in piece part manufacture.

NO. 4A PLUG-IN TRUNKS

After completing the move of a No. 4A plug-in trunk shop, engineering introduced into manufacture the redesigned two-way intertoll plug-in trunk. This resulted in a 28 percent decrease in this product's cost to our Bell System customers. In addition, one new printed wiring board design and four major PWB changes were added to production.

4E ELECTRONIC TIMER

The 4E electronic timer, designed and manufactured at Omaha, was introduced successfully. Two of these timers are required in each No. 5 crossbar office equipped for one-second timing of long-distance calls. Approximately 7,000 4E timers have been produced as of December 15, 1977.

Design work is now underway on a timer for the New York Telephone Company which would be used as the timing reference for long-distance calls through ESS offices.

MWSR IN-LINE WELDER

A low voltage contact welder for miniature wire spring relay single wire blocks, designed and constructed at Omaha, was introduced into production. This machine makes use of a programmable controller to select automatically and control the percussive weld of contacts to wire tip on various codes of the miniature relays.

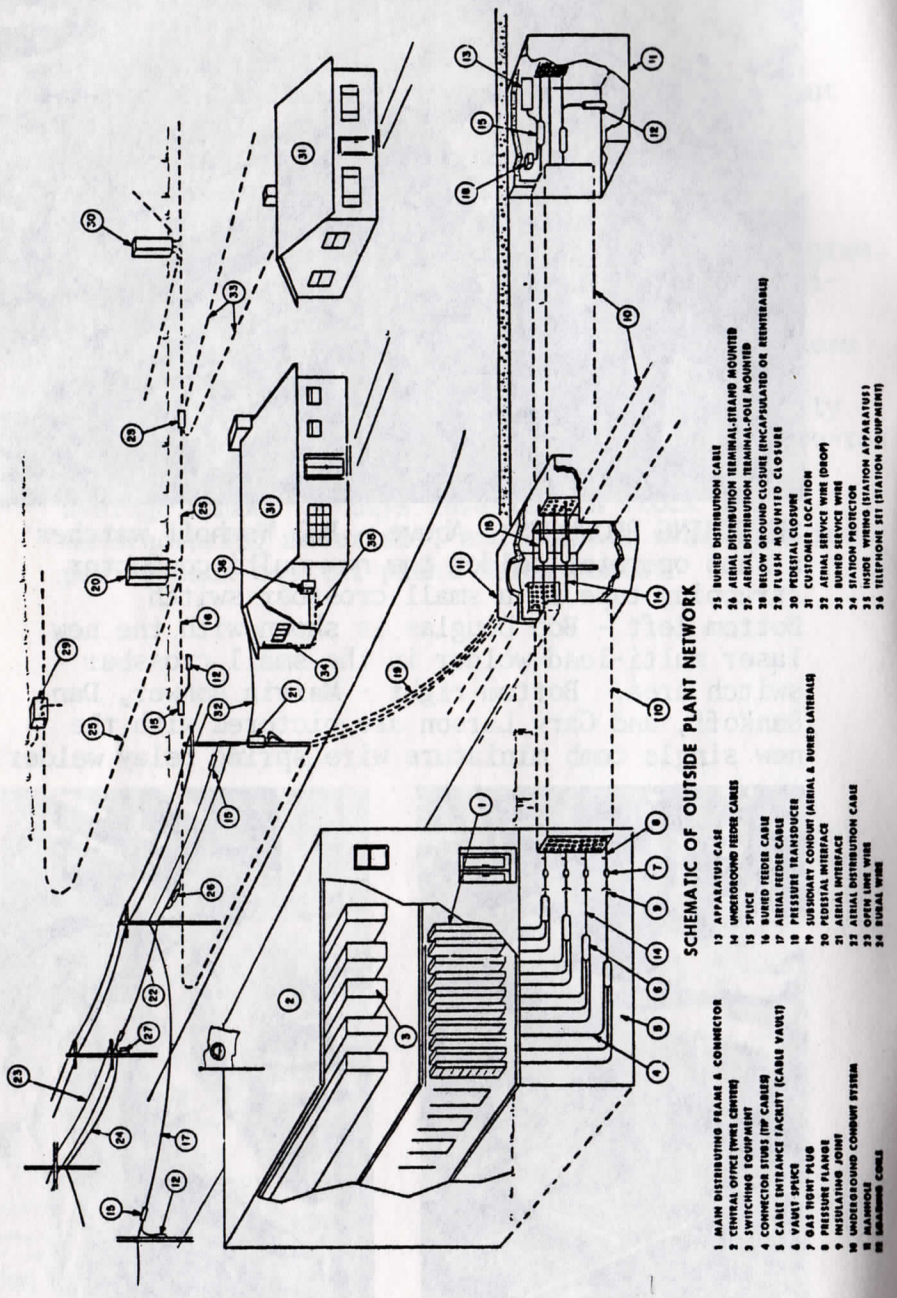
MWSR POTENTIAL SALES INCREASE

During 1977, potential sales of miniature wire spring relays were increased by 800,000 annually. The program included contacts with BTL and WECO engineers for equipment that potentially might use miniature wire spring relays but is not now using them. Equipment changes are under way or have been made, which will result in the above-stated increase in sales. Other changes are being considered that may result in still further increases, as time permits, to make the equipment design changes.

THE IMPACT OF INVENTORY CHANGE ON CAPITAL PLANT RECOVERY DOLLARS

Evaluating the changing impact of raw material, in-process and finished goods inventory for input to the cumulative discounted cash flow (CDCF) program can become a time-consuming task. To reduce time required for this evaluation, a computer program was written to estimate the inventory change data required for the CDCF program. The computer program was designed to allow sensitivity testing of individual input data such as production schedules, stock quantities, in-process goods, raw material, material cost per unit and standard cost. This data provides an opportunity to generate estimates of basic gross profit, pre-tax earnings required on production and inventory, average number of days invested in stock and manufacturing materials, and dollars available for paying back capital plant investments.

SWITCHING PRODUCTS: Above - Bob Wemhoff watches a shop operator solder the new multi-conductor strapping tape to a small crossbar switch Bottom left - Bob Douglas is shown with the new laser multi-lead welder in the small crossbar switch area. Bottom right - Marvin Rohwer, Dan Dankoff, and Gary Larson are pictured with the new single comb miniature wire spring relay welder.



SCHEMATIC OF OUTSIDE PLANT NETWORK

1 MAIN DISTRIBUTING FRAME & CONNECTOR
2 CENTRAL OFFICE (WIRE CENTER)
3 SWITCHING EQUIPMENT
4 CONNECTOR STUBS (TIP CABLES)
5 CABLE ENTRANCE FACILITY (CABLE VAULT)
6 VAULT SPLICE
7 GAS TIGHT PLUG
8 PRESSURE FLANGE
9 INSULATING JOINT
10 UNDERGROUND CONDUIT SYSTEM
11 MANHOLE
12 LOADING COILS
13 APPARATUS CASE
14 UNDERGROUND FEEDER CABLES
15 SPLICE
16 BURIED FEEDER CABLE
17 AERIAL FEEDER CABLE
18 PRESSURE TRANSDUCER
19 SUBSURFACE CONDUIT (AERIAL & BURIED LATERALS)
20 PEDESTAL INTERFACE
21 AERIAL INTERFACE
22 AERIAL DISTRIBUTION CABLE
23 OPEN LINE WIRE
24 RURAL WIRE
25 BURIED DISTRIBUTION CABLE
26 AERIAL DISTRIBUTION TERMINAL-STRAND MOUNTED
27 AERIAL DISTRIBUTION TERMINAL-POLE MOUNTED
28 BELOW GROUND CLOSURE (ENCAPSULATED OR REENTERABLE)
29 FLUSH MOUNTED CLOSURE
30 PEDESTAL CLOSURE
31 CUSTOMER LOCATION
32 AERIAL SERVICE WIRE (DROP)
33 BURIED SERVICE WIRE
34 STATION PROTECTOR
35 INSIDE WIRING (STATION APPARATUS)
36 TELEPHONE SET (STATION EQUIPMENT)

LTA Products

Loop transmission apparatus (LTA) is apparatus used in the telephone company's outside plant network of subscriber loops which connect the central office to individual customers. As shown on the accompanying diagram, the outside Plant network includes a wide range of LTA products now manufactured at Omaha, such as connectors (1), stub cables (4), cable entrance facilities (5), loading coils (12), pedestal and aerial interfaces (20) and (21), distribution terminals (27), and closures (28) and (29). In addition, other LTA products, such as specialty tools and test equipment, are produced at Omaha.

During 1977, the LTA product line at the Omaha Works continued to grow at a rapid pace, as new products were introduced and existing product offerings were expanded. New products at Omaha now include loading coils, 10-type cable stubs, 16-type closures, and test sets. As evidence of expansion, the 40-type cabinet line grew to include larger cabinets, new connector options, and a wider range of use in outside Plant.

Through this product line, we also are bringing new manufacturing technology into Western Electric. For example, vacuum-forming and hot-stamping equipment is on order to begin high-volume manufacture of covers for buried and aerial closures during 1978.

Also during the year 1977, new products such as the redesigned "B" cable terminals were allocated to the Omaha Works and we responded to more than 80 special development requests to satisfy unique applications of our products by our customers.

All of the above events combined to provide a year characterized by growth and challenge, with every indication that the upward trend will continue in the future.

40-TYPE CABINETS

The 40-type cabinet family consists of heavy-duty metal cabinets equipped with either 88-type quick clip connectors or 76-type binding post terminals. The cabinets are used in FDI and RAI applications. During 1977, approximately 5,700 cabinets were produced, compared to an output of approximately 800 in 1976.

Two new larger cabinets (the "F" and "H") were introduced. New applications were found for the cabinets, such as South Central Bell's switched RAI and the Transmission Division's SLC-8, a small carrier system. The Omaha Works responded to more than 80 telephone company requests for special cabinet configurations and for the development of other outside plant interface equipment.

Also during the year, BCA 495H was approved for the manufacture of 76-type binding post terminals. More than 90 percent of the four-account facilities were installed and 70 percent of the permanent tooling was completed. The 1978 program is estimated to be approximately 10,000 cabinets.

115 APPARATUS BOXES AND "G" CABLE TERMINAL BOXES

These product lines were transferred from Baltimore late in 1976. During 1977, Omaha Works' efforts were directed toward providing high-volume manufacturing capacity, and 286,000 boxes were produced. Two of the 115-type codes were manufacture discontinued to reduce inventory, tooling, and to improve the manufacturing operation. The plant color was changed to eliminate costly paint line changeovers. The Works also began investigating the use of thread-forming screws to eliminate tapping operations. Production for 1978 is estimated at 266,000 boxes.

B-TYPE CABLE TERMINALS

The B-type cable terminal is a family of binding post cross-connect boxes used in outside plant. This product line recently was redesigned; the new BK/BL design will use miniature binding post in three basic cabinet sizes to provide capacities from 100 to 900 pairs.

During 1977, manufacture of the new BK/BL series was allocated to the Omaha Works. Initial production is scheduled to begin in second quarter 1978. Demand is estimated to be approximately 7,000 cabinets per year.

16-TYPE CLOSURE

16-type re-enterable closures are used in buried plant to enclose waterproof or PIC cable splices up to 900 pairs. They are used for straight, butt, or branch splices.

Starting in the summer of 1977, Omaha began assembling 16B2, C2, and D2 sizes. The Works will be molding 16B2, C2, D2, and E2 covers by the end of 1978, using vacuum-forming equipment presently on order. In 1977, the Works assembled approximately 35,000 16-type closures. Approximately 414,000 16-type closures make up the 1978 program.

2-TYPE CLOSURE

Polypropylene 2-type closures are pressure-tight underground and aerial closures used to enclose cable splices. The closures, coded into a 2C2 series with eight-inch ID and 2D2 series with 9 1/2-inch ID are available in 28 1/2-inch, 36-inch, and 44-inch lengths.

Omaha produces all 36-inch and 44-inch length closures by cutting 28 1/2-inch length covers and heat-fusing the cut edges together. Stainless steel bars and bolts also are mounted on the fused covers. Approximately 11,000 closures were produced in 1977. The 1978 program is approximately 18,000 closures.

50 AND 51-TYPE CLOSURES

A new design closure is under development at BTL, Atlanta with the final LDI expected in February 1978. Omaha successfully bid for the manufacture, and has obtained approval for a $480,000 BCAR. A 600-ton hydraulic press and an oven have been ordered, and work is progressing on automation and assembly equipment. A form tool for one of the four closure models has been ordered.

The new design uses long-fiber, glass-filled polypropylene that can be formed only by "hot stamping," i.e., heating the plastic to a forming temperature, placing it into the mold, and molding with high pressure in water-cooled tools.

This product is expected to replace cast iron and aluminum splice cases.

10-TYPE CABLE STUBS

The transfer of 10-type cable stub operations from Baltimore to Omaha was initiated in November 1976 and essentially completed in May 1977. A new coiler, polyurethane dispenser and miscellaneous small facilities were installed. Capacity was increased from 117,000 to 168,000. Approximately 50 jobs and $7,000,000 in production were acquired. Approximately 83,000 stubs were produced in 1977. The 1978 program is estimated to be 125,000 stubs.

710A VAULTLESS CABLE ENTRANCE FACILITY

The 710A vaultless cable entrance facility manufactured in the Cabinet Shop is a compact metal and aluminum enclosure to connect outside Plant cable to central office distribution cable. The facility uses Omaha-manufactured 710 connectors and provides 900-pair splices in a nine by 60-inch wall space.

The first major shipment was made in December 1977 to Grand Island, Nebraska, for a 42,300-pair installation.

DIMENSION CIRCUIT PACK CARRIER - DENVER

The dimension circuit pack carrier presently in use consists of extruded aluminum guide details secured to end plates with screws.

During 1977, Omaha developed, in conjunction with Denver engineers, a new carrier consisting of formed steel channels which replaces the aluminum extrusions. The design will be a completely welded construction, eliminating the present costly hand-assembled version.

Cost reduction due to the new design: approximately $750,000 per year. Production will begin in 1978.

OUTSIDE PLANT TEST SETS

Plans were developed to introduce manufacture of outside plant test sets at Omaha. No. 4 plug-in trunk facilities and floor space was used as a base to build the shop.

The 182A test set was the first product to go into manufacture in December 1977. This central office test set checks the operate and standby modes of the solid state mini-bridge lifter, which is incorporated as a part of the 4A11C protector unit.

A demonstration set for the 145A multipurpose test set also was manufactured in 1977. This demonstrator is used by the account representatives to demonstrate applications of the 145A.

LOADING COILS

Production of the 710 loading coil case began in Omaha during April of 1977. The installed coil capacity is 2,500,000 and the current production is 30,000 coils per week. The new design 720 series loading coil cases will be introduced at Omaha during the first and second quarters of 1978. The total capacity will be 12,000,000 coils on a two-shift, five-day basis.

These cases provide inductance for insertion into a cable circuit to improve transmission characteristics on longer cable lengths.

R-4707 INSTALLATION TOOL

The R-4707 installation tool is being custom-built for use by Western Electric installation for splicing central office cables with 710 connectors.

710A TOOL MOUNT

The 710A tool mounting is a mounting system for tools used to assemble 710 connectors. The parts provided can be assembled in various configurations. This allows the mounting of 710 connector tools on a variety of objects. Examples are the splicing box, pedestals, ladders, platforms, and manhole racks.

836A TOOL

Another tool in the LTA products is the 836A, which is a lightweight tool used to assemble 710 connectors. The tool cuts and presses five wire pairs per manual operation. Thus, five operations are performed for each 710 connector component.

630A4 CONNECTOR

Omaha will begin punching the phosphor bronze connector element for the 530A4 connector block. This connector block is a modular plug-type connecting block used for wall-mount station sets. The assembly of the connector block is being done at Shreveport with Omaha supplying the entire schedule of elements by year-end 1978.

108 CONNECTOR

The 108 connector is a new design connector in the 88-type family, exclusively for use in outside Plant applications. Initial introduction will be in 40-type cabinets with controlled introduction scheduled for early 1978. This connector not only will give the telephone companies a substantial cost savings over previous systems, but it also will supply additional reliability desired for quick clip connections.

109 CONNECTOR

The 109 connector is a new two-piece, sandwich-type connector block to be used as a high-density cross-connect field between switching frames in central offices. The 109 will use the same connector elements used in the 108 and will be assembled using similar facilities to the 88. Initial field trials are scheduled for early 1978 with formal production scheduled for mid-year 1978.

710 CONNECTOR

The 710 connector is designed for joining air core or waterproof PIC or pulp-insulated conductors in underground, buried, aerial, and various central office applications. It provides a rapid method of splicing, bridging, or half-tapping large pair count, 20-through 26-gauge, aluminum and copper cables in 25-pair increments without stripping the insulation. The splicing connector consists of three components: index strip, connector module, and a cap. The connector module may contain a non-hardening sealant for use where moisture-resistant connections are required.

"B" WIRE CONNECTOR

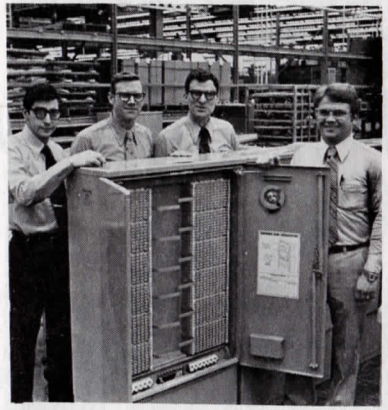
The "B" wire connector is designed to be used on copper and aluminum conductors with PIC or pulp insulation. The connector is available loose or on tape. It consists of a phosphor bronze insert with internal tangs, an outer brass shell, and an insulating jacket. A mylar lining eases wire insertion by covering the connector tangs.

711 CONNECTOR

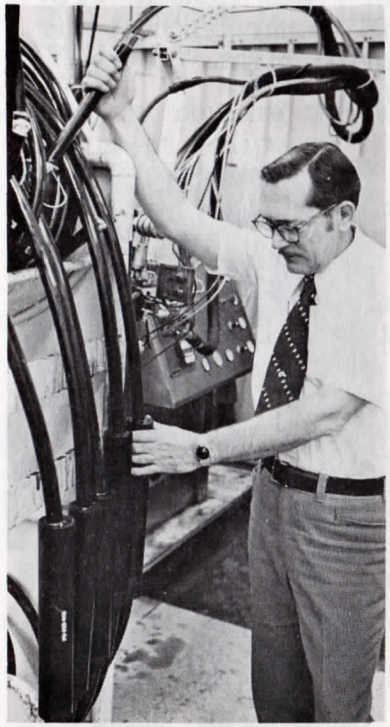
The 711 connector is designed for mass termination of central office wire and cable and has the capability of splicing, bridging, and half-tapping. The connector uses double-ended slotted beam contacts and is designed for application when a limited number of reconnects (10 or less) are anticipated. The contact element makes use of a newly developed Cu-15Ni-8Sn alloy (Spinodal) which was selected for its high strength and elasticity. A basic connector consists of one module assembly containing the slotted beam contacts, two receptacle-wire holders, and four mandrels. Four mandrel sizes are required to accommodate 22-through 26-gauge wire. Designs for connector sizes of 8, 12, 25, and 32 pairs are included in the 711 family.

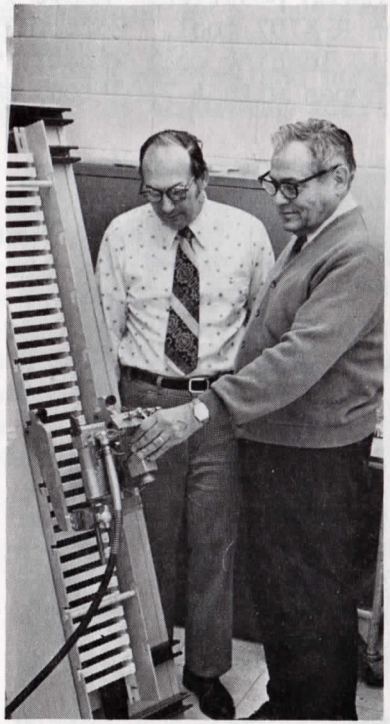
88 CONNECTOR

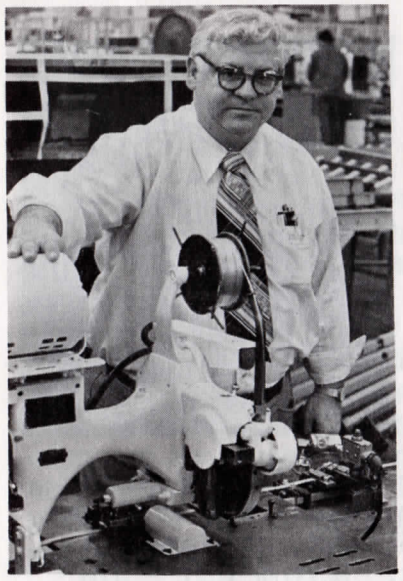
This connector is designed for joining 22-through 26-gauge wire without the need of prestripping the wire insulation. The design intent is for application in building entrance terminals and key telephone systems where a compact, easily readable, quick connection panel is required. The 88 not only handles the variety of wire gauge and insulations encountered in these applications, but it also can be reused a minimum of 40 times. A major achievement in process is the transition from gold plating of the connector elements to continuous solder plating.



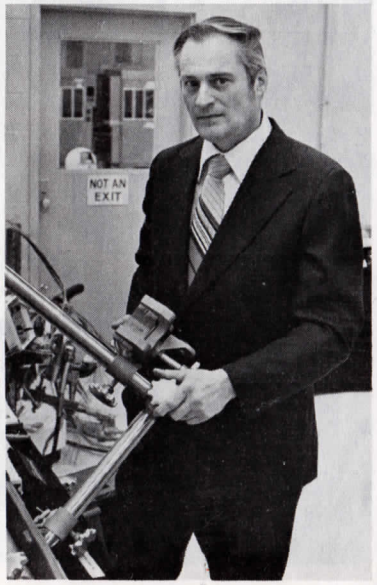
LTA PRODUCTS: Above left - Steve Alloway in the 2-type closure area. Above right - Bob Slothower (left), Bill Hurd, Harold Slaight, and Lyndon Ensz with a 40-type cabinet. Bottom left - Jim Goodbarn inspecting a 10-type stub cable. Bottom right - Ed Karohl and George Elafros inspecting the 710A vaultless cable entrance facility.







LTA PRODUCTS: Above left - Charlie Bystrek with a connectorized 710 loading coil assembly at the CONECS position. Above right - Wes Nicholas with an R-4707 tool. Bottom left - Denny Lynch at the 710 loading coil winder. Bottom right - George Pappas with a 710A tool mount.



Cable and Wire Products

ENAMELING

The principal engineering undertaking in 1977, the transfer of the enameling operation from Buffalo to Omaha, essentially is complete. The last machine to be installed, the Italian SICME, is slated to be operational just after the first of the year.

Secondary only to the transfer itself was the concern over the environmental pollution effects of the enameling oven exhaust fumes. A direct flame incinerator has been installed, therefore, to completely oxidize the more offensive fumes to an odorless combination of carbon dioxide and water. This approach is being supplemented by a complete redesign of the enameling machine oven exhaust system, to reduce the load being handled and hopefully to obviate the necessity of acquiring additional abatement equipment.

A shrinking and changing system demand for enameled wire has resulted in a large portion of the installed manufacturing capacity being idle. New product development programs have been under way to reactivate this unproductive equipment: A low temperature soldering polyurethane is already in production, and initial successful test samples of a nylon over polyurethane construction which have been prepared give promise of a substantial entry into this high-demand area in 1978.

WESTERN ELECTRIC FLYER STRANDER

The exchange area stranding and cabling engineers made an engineering evaluation of nine types of stranding facilities for possible use at Omaha. Through the use of a computerized capacity program and visits to three plants, a decision was made to use a surplus Western Electric-designed flyer strander from Kearny and surplus supply stands from Omaha's vinyl area. Blanket Capital Appropriation Request 467H was prepared and subsequently approved June 13, 1977.

Engineering design changes, which include mechanical modifications and a new electrical control system, are continuing on this project. The new strander will provide the flexibility needed to balance the loading of present equipment and to accommodate variations in pair size and gauge mix. It will manufacture 50, 75, and 100 pair core at a higher speed than any of the Omaha Works' existing stranders. Final installation is projected to occur in October 1978.

CONSOLIDATION OF BUFFALO VINYL WIRE AND CABLE PRODUCTS

The transfer of the irradiated PVC and miscellaneous wire and cable production from Buffalo to Omaha was completed in 1977. This required the transfer and installation of irradiation facilities, plastic insulate lines, coilers, and spoolers. Work is continuing into 1978 to complete the consolidation of Buffalo facilities into the Omaha Works.

IRRADIATED VAULT OPERATION

Installation of the last two irradiated polyvinyl chloride (IPVC) vaults was completed in the second quarter of 1977. This puts a total of four vault complexes in operation. Each vault complex consists of an electron beam accelerator inside a concrete vault, four combination wire payoff and take-up units and associated wire handling and testing facilities. IPVC plastic that is cross-linked in the irradiation vaults replaces the textile-lacquered insulation on many product codes.

CORRUGATED METAL PARAMETER TEST SET

A prototype test set has been installed on exchange cable sheathing line 11 that provides the following information on sheath application: length of cable, velocity, corrugations per inch for aluminum and steel, percentage of flat aluminum and steel tape to the finished cable length, and registration of one tape to the other. The system operates with five electro-optical transducers, two located on each of two corrugators and one on the cable length tracking unit. These signals are digitally treated to provide the information. System accuracy is designed to be better than .1 percent.

HORIZONTAL TWISTING

The horizontal twisting area installation was completed in 1977. The area consists of nine twisters and has a weekly capacity of 55 MCF. A horizontal twister is capable of producing pairs, triples, multiple twin quads (two pairs), spiral fours (four singles), or five wire combinations. Fourteen different codes of wire are twisted in this area.

PHASE-OUT OF "U" TYPE DFW

Another step in the replacement program of textile covered wires was taken when production of the composite vinyl textile lacquer-coated "U" type distributing frame wire was terminated in December 1977. The wire was replaced by a PVC irradiated DT type wire that is approximately 40 percent smaller in cross section area, has better fire retardancy properties, and costs less to make. The smaller size increases central office wire frame capacities. The replacement generated savings of more than $500,000 for Omaha in 1977. Work is continuing on the development of other irradiated wire that would make suitable substitutes for the remaining textile served and braided wires.

NORTHAMPTON STRANDER

The transfer and installation of the Northampton strander from the Buffalo Works to the Omaha Works was completed in 1977. Strander line consists of two 52-position Eastern supply stands and a Northampton 54-inch take-up with a core binder head.

This machine is capable of stranding from four to 100 pair cable at speeds up to 1,000 feet per minute on the smaller cable and about 600 feet per minute on the larger sizes.

One of the main features of this facility (other than speed) is the simplicity of reversing the cable lay and the ease of changing from six-inch to a 15 1/2-inch lay length.

MODIFICATIONS TO PVC TANDEM INSULATING LINES

This project was undertaken to reduce the cost of manufacture of PVC insulated wire by eliminating and replacing parts of the insulating lines which had been identified as causing losses in machine yield as well as unpredictable variations in conductor diameters. These modifications enabled the insulating lines to operate more efficiently. They require fewer machines and less labor, thereby resulting in savings. Through these modifications the Omaha Works was able to reduce the number of lines required due to the Buffalo consolidation from 12 to 10. The modified lines are capable of running in a narrower range of conductor diameters, providing a lower average conductor diameter with a consequent reduction in copper usage. This was accomplished by providing each machine with a wire trimmer just prior to the extruder crosshead. This dancer assembly provides a means of controlling the tension in the wire which could vary due to any speed fluctuations between the capstan and wire draw drives.

1,200 AND 900 WATERPROOF CABLE

In May 1977, the Omaha Cable Plant manufactured its largest waterproof cable to date. The 1,200-pair, 22-gauge cable with DEPIC insulation was manufactured as a result of a request from New York Bell and Atlanta PECC. The 3.45-inch OD cable required a 10 3/4-inch steel strip, and a 9 1/4-inch aluminum strip, and weighed approximately eight pounds per foot upon completion. The cable was made on special Omaha design tooling and was six weeks from conception to actual shipment to New York Bell. Approximately 4,300 feet were shipped to the customer and have been placed in service with other lengths supplied to PECC for evaluation.

In December 1977, Omaha manufactured 900-pair, 22-gauge DEPIC waterproof cable. This 2.95-inch OD cable will go into standard production at Omaha in 1978 and will be the largest cable available as a standard cable. Both of these group IV waterproof cables were the result of Western's and Omaha's efforts to respond to the customer's needs and desires.

NEW FINE GAUGE WIRE DRAWING MACHINES

Two new Italian-made (SAMP) No. 4 wire drawing machines were operational by November 1977. These machines are designed to produce fine gauge tinned and annealed copper wire at speeds approximately 50 percent higher than our older No. 4 machines. Engineering studies to achieve maximum speeds are continuing.

MODIFICATION OF AUTOMATIC TAKE-UP

Modification of 28 automatic exchange insulating take-ups has improved machine performance, productivity, and quality. These goals were achieved by redesigning the transfer mechanism and the reel shrouds. The new transfer mechanism uniformly positions the conductor prior to transfer, thus improving transfer reliability and allowing immediate transfer of poor quality reels. The new shroud will reduce insulation damage on the full reel after transfer and controls the loose end of the full reel so it does not become entangled with the outer conductor convolutions.

NO. 1 WIRE DRAWING SECOND STEM PACK TAKE-UP

Omaha installed a second stem pack take-up on an existing No. 1 wire drawing machine during 1977.

The stem pack take-up is a continuous coiler which takes the copper wire up on a stem, automatically changing the stem when it is full. This continuous operation eliminates the start and stop functions normally required when changing take-up spools as performed on other wire drawing machines.

The original configuration of this machine was not altered; therefore, it has the unique feature of using the original take-up system (spools which hold 1,100 pounds of copper wire) or the new stems which hold 5,000 pounds of copper wire. This is an important feature which gives the needed flexibility in meeting copper demands from the various insulating operations.

When the third stem pack take-up is installed in 1978, estimated cost reduction savings of $60,000 will be realized.

WASTE DISPOSAL FACILITY

A vacuum still waste disposal facility has been acquired which will reduce all waste solution generated from the cable plant wire drawing compound system into the components of distilled water, oil sludge, and filtered solids. The components can be disposed of readily in accordance with the Environmental Protection Agency (EPA) regulations. Installation will be accomplished in the first quarter of 1978 which will eliminate the present practice of disposing of waste at the landfill.

DEPIC DUAL EXPANDED PLASTIC INSULATED CONDUCTOR

The DEPIC process was introduced in exchange insulating in 1976 on 22 dual insulating lines. Additional capacity was added in 1977 with six more lines modified for dual extrusion, bringing the total to 28 dual lines. The major modifications to the six lines and to the previous 22 lines were a platform-mounted vertical extruder in tandem with the existing extruder; a motor-actuated cooling trough for controlling extrudate expansion; and associated electrical drives and controls. The diameter of the insulation can be reduced because the foam-skin combination of DEPIC provides an improved dielectric when compared with solid insulation. This results in longer reel lengths and decreases the insulation and cable sheathing materials required. Cost reduction savings realized in 1977 were approximately $2,000,000.

FINE GAUGE WIRE DRAWING

Installation of the fine gauge wire drawing machines relocated from Buffalo was completed in 1977. A total of 207 machines and their supportive compound systems are operational. The compound systems which supply the wire drawing lubricants are segregated into three separate units, each with a different solution. A significant improvement incorporated in the design of the compound tanks is the cyclonic centrifuge units to clean the solutions. Sludge and insoluble impurities are removed continually from the recycled compounds, thereby extending their useful life. The combined working capacity of the three systems is 34,000 gallons.

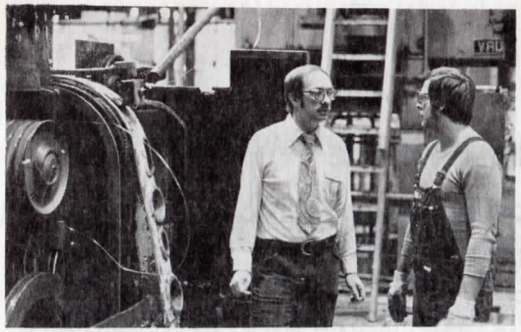
CENTRAL ELECTROTINNING MACHINE

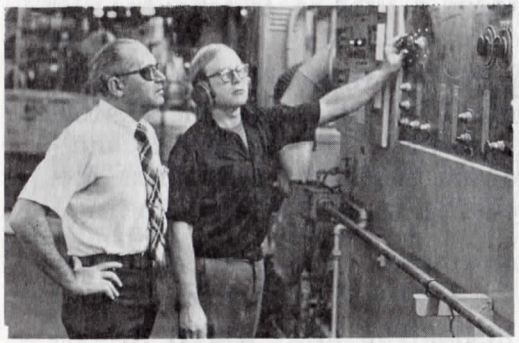
The installation of the central electrotinning machine was completed in July 1977. This machine is now supplying all tinned 13-gauge supply wire for the PVC tandem extrusion lines. Previously this wire was made on tandem line in-line tinners. Extra heavy tinned supply wire for the fine gauge sizes of tinned wire drawing processes also is made on the central plater.

The associated evaporative recovery system for water pollution control is operating successfully. Cost reduction will result from reclaiming the stannous fluoborate and fluoboric acid from the rinse waters and reusing it in the tin plating sections.

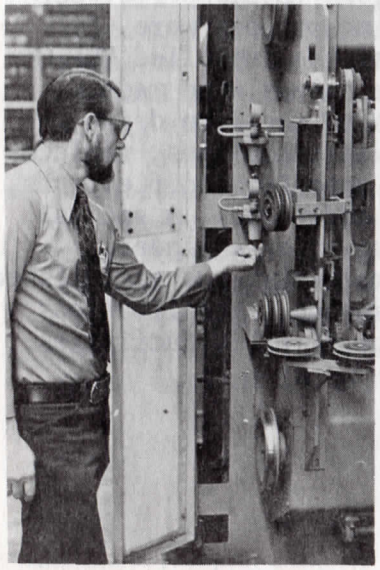
INCREASE EXCHANGE INSULATING LINE SPEEDS TO 5,000 FEET PER MINUTE

Line speed increases from 4,000 to 5,000 feet per minute in the DEPIC insulating process were accomplished on 60 percent of the installed DEPIC facilities. The higher line speeds were made possible after modifications to the line drive ratios, water-cooled clutch installations, replacement annealer transformers, annealer modifications, and programmable controller additions. A special line speed-up team consisting of an engineer, operator, electrician, and machinist was established to achieve the higher line speeds. Modifications are continuing on the balance of DEPIC facilities requiring changes.

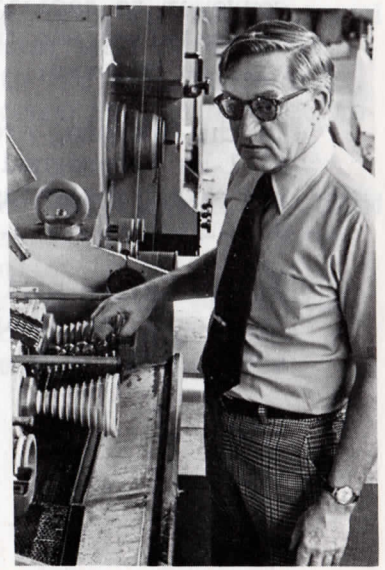




CABLE AND WIRE PRODUCTS: - Top Tom Heim (left) at the No. 1 stem pack take-up. Middle - Horst Woellner at the start-up of a new line. Bottom left - Larry Lamb at the annealer for the modified insulating lines. Bottom right - Larry Moody (left) and Phil Lawler discuss the capability of the modified annealer.



CABLE AND WIRE PRODUCTS: Above - Joe Swenson checks the cable lay at the Northampton strander take-up Bottom left - Bill Kinsley examines the edge-forming key in steel tape overlap die. Bottom right - Lee Baldauf checks the die string-up on SAMP No. 4 wire drawing machine.



Station Cord and Fine Wire Products

TELEPHONE CORDS, BRAIDING AND SPECIALTY WIRE AND CABLE PRODUCTS

By the end of 1977, the installation and prove-in of all equipment transferred from Buffalo was completed.

Looking ahead to 1978, a fourth SAM machine and a conveyor to facilitate handling of conductor will be installed and the remaining crossbar equipment will be removed.

In the braiding area, moving parts of the braiders will be redesigned to use sound-absorbing material, and sound-absorbing partitions and curtains will be installed.

An aggressive selling campaign is being formulated to obtain new business for the Specialty Wire and Cable Shop.

STATION CORDS

Manufacturing equipment continued to be installed in the station cord area during 1977. When this project is completed in 1978, the Omaha Works will have an authorized capacity of 25.75 million cords per year.

The following equipment was installed: three tinsel rollers, two nylon doublers, 14 servers, seven rewinders, four insulators and six jacketing lines. All telephone cordage manufactured at the Omaha Works starts with 5/16-inch diameter phosphor bronze rod. The rod is drawn to 37-gauge wire and rolled into tinsel .0009 thick. The tinsel is served around a nylon core and insulated with a polyester compound to form a conductor for the telephone cord. Four of these conductors are placed in a side-by-side configuration and jacketed with PVC to complete the manufacturing of telephone cordage.

Two basic types of telephone cords are manufactured from this cordage: the modular wall cord, which connects the telephone set to the wall receptacle, and the spring cord, which connects the handset to the phone base.

Six automatic machines, three SCRAM and three STRAM, were installed to manufacture wall cords in three standard lengths. The installation of automatic machines to assemble modular plug ends eliminated the need for a manual assembly, and provided a current year savings of more than $1,000,000.

Three SAM machines were installed to manufacture spring cord bodies in two standard lengths. The SAM machine combines the separate operations of coiling on mandrels, heat treating, cooling and reversing the twists. The manufacture of cord bodies on the SAM machine provided a current year savings of more than $800,000.

The cord bodies manufactured on the SAMs are transferred to the PRAM machines by a conveyor system installed in 1977. The PRAMs then assemble modular plug ends automatically. The automatic assembly of plugs on the PRAMs provided more than $600,000 in current year savings.

Various test equipment was developed to evaluate the product conformance with Bell System specifications. The mechanical parameters required gauges to measure blade height, conductor lock and jacket lock. A powered pull test set was developed to check electrical and mechanical requirements under stress. To handle large quantity electrical continuity, a group testing system was implemented.

BRAIDING

390 cotton braiders were transferred from the Buffalo Works to braid a cotton insulation on BH and AM wire codes. Eight Hacoba cotton winders were installed to supply the braiders with cotton. Ten New England Butt braiding heads were modified and installed to manufacture sleeving which is shipped dry or impregnated with oil and aloxite powder. Wax-impregnating facilities were installed to manufacture "J" wire and two braiders for the manufacture of fire detection wire also were made operational.

Because of the high noise and cotton lint levels generated by the braiders, the area in which the braiders are installed has been closed off to contain both the noise and lint. A special air-handling system with large lint-catching filters was installed to condition the air in the braiding room.

SPECIALTY WIRE AND CABLE SHOP

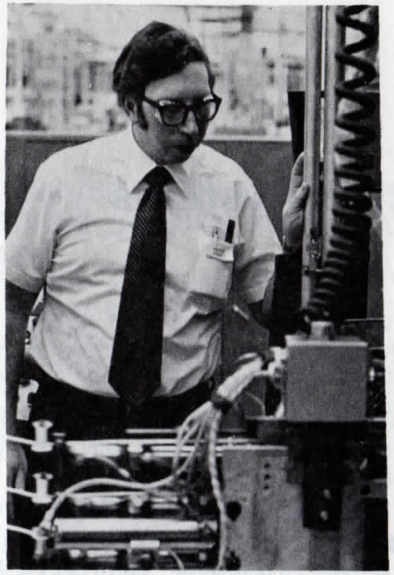
The Specialty Wire and Cable Shop is a newly formed department made up of a variety of facilities which were transferred from the Buffalo Works.

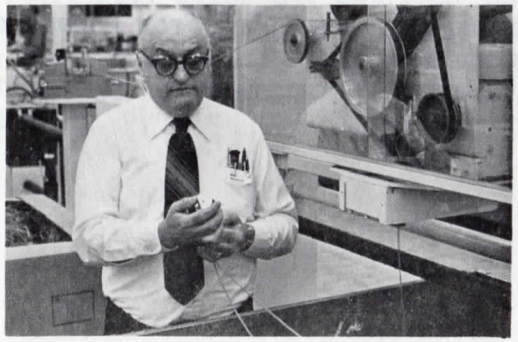
The Specialty Shop is designed to handle low-volume products which often are difficult to obtain from high-volume production shops. The operations performed in the Specialty Shop are stranded-wire insulating, cable and wire shielding, wire spooling, cable stranding, half-inch tight twisting, cable coiling, shielded wire rewinding, and packing and shipping.

Prior to completion of the stranded wire insulating lines, customer demand for DD-1 wire was met by modifying a station cord jacketer to make DD-1 wire. Wire was taken up in a barrel and then rewound on 533 reels for shipment.

The following equipment has been installed in the Specialty Wire and Cable Shop:

1) Four wire insulating lines for the manufacture of DD-1 wire and pushbutton wire.
2) One drum strander for stranding flat, oval, and round cables of unusual constructions.
3) Two wire spoolers for spooling wire onto 267 spools.
4) Twelve wire shielders for shielding BK and P wire.
5) Three cable shielders for shielding switchboard cable.
6) Two tight twisters for producing a half-inch twist in BW wire.
7) One shielded wire rewinder to rewind BK and P wire onto plateboard reels.
8) One cable coiler and reel rewinder to coil non-stock cable codes.





STATION CORD AND FINE WIRE PRODUCTS: Top left - Marvin Rohwer with one of the SAM machines. Top right - Bob Loesch in the PRAM area. Middle - Bob Kemp at one of the DD-1 insulation lines. Bottom - Dick Myszewski in th jacketing area.

Information Systems

The ISD organization has had a busy and productive 1977. In line with our continuing efforts to achieve maximum cost effectiveness, emphasis has been moving to more on-line systems and to divisional and corporate systems.

On-line systems place control of files with the user as well as providing up-to-the-minute information on those files. Supporting these on-line systems are 20 Dataspeed/40s, a product of Western Electric, installed throughout the Works. Seven systems presently have on-line capability, with more planned for the future.

ISD is involved in development of four corporate/divisional systems. Seven corporate/divisional systems have been implemented at Omaha and two more will be implemented in 1978.

The 1977 cost savings resulting from local, divisional, and corporate projects amounts to $1,187,500. A brief description of some of the major projects follows.

MERCHANDISE PURCHASING SYSTEM (MPS)/ACCOUNTING RECEIVING EXCHANGE SYSTEM (ARX)/ARX ACCOUNTING SYSTEM

The Omaha Works is implementing the corporate MPS system and divisional ARX system. Both are IMS systems with on-line entry from the Purchasing Department and receiving dock. This system is designed to carry a purchase from the request to the receipt of the goods ordered. In addition, the Omaha Accounting and ISD Departments are working with the Baltimore and Columbus Works in the design of an on-line accounts payable, which will match the receipt of goods to the invoice from the vendor and make the payment. This accounting system will be divisional for cable and switching.

The MPS system, scheduled for implementation in January 1978, will allow CRT entry of purchase requisitions, purchase orders, acknowledgements, and promises. The system will provide up-to-date information to the expeditors, receiving, and vouchering. It will also provide more information for management to review purchase activity and to improve service and response to the Works.

The ARX system, which is integrated with the MPS system, also was to be operational during January 1978. It will allow CRT entry on the dock as shipments are received, and prepare routing tickets to send on with the items. The system also will provide reports for vouchering, traffic, inspection, and purchasing.

CORPORATE COST BULLETIN SYSTEM

The cost bulletin system was developed as a switching equipment divisional system at the Omaha Works. While using CBS to accomplish the 1977 general revision, the six SED locations and the Montgomery Plant obtained first-year cost savings in excess of $2 million. During 1977, enhancements to the system included the following:

1) Perpetual maintenance
2) On-line costing
3) Provisions for accommodating cable products
4) Incurred cost studies in support of PLPM activities

CBS is being installed at Atlanta, Baltimore, Phoenix, Indianapolis, and Kearny. Twelve locations will use CBS to accomplish the 1979 general revision, accounting for about 65 percent of the costs generated in the company. The pricing organization has acquired terminal facilities to access standard cost data at the 12 user locations and has eliminated the requirement for those locations to forward hard copy forms for each cost to pricing.

Recently, CBS has been designated a Corporate system. The Cable and Wire Division will receive $186,000 during 1978 in support of CBS development and maintenance.

CUTTER-BALANCER SYSTEM

This system, following Corporate rules, matches exchange cable stock and non-stock customer orders with reels in inventory. It selects orders completely or partially, depending on available stock, placing emphasis on usage of short reels. It then requests production of unfilled orders and rebalances the strander loads.

The computer, in five minutes of CPU time, makes thousands of trial combinations of comparisons from among approximately 500 orders and 3,500 reels before selecting the best match. This job is very well-suited for the speed and accuracy of the computer.

Plans are to embed the cutter-balancer into the Omaha exchange cable system prior to generation of the cable delivery tag sets. This will allow the system to make good use of cable inventory before establishing the weekly manufacture load.

In summary, a list of advantages is as follows:

1) Improve service to the customer.
2) Cost reduction of $500,000.
3) Eliminate manual selection of orders.
4) Select part of order and load the rest.
5) Reduce number of reels loaded on the shop.
6) Reduce number of short reels in inventory.
7) Reduce inventory.
8) Reduce quantity of MD cable.

PLANT ACCOUNTING

In an effort to standardize and mechanize Plant accounting within the Cable and Wire and Switching Divisions for both Plant and expense, and machinery records, system specifications were developed and consolidated by user committees established in both divisions. Shortly thereafter, a study of all available mechanized plant accounting systems in relation to the specification criteria was initiated. It was determined that the Merrimack Valley system best satisfied these requirements. However, a significant ISD development effort was necessary to modify the Merrimack Valley system to provide the following: multilocation capability and consequent data base security measures; conformance to Centralized Data Center standards; and essential enhancements to the current system commensurate with the user's specification.

Omaha ISD was given the responsibility of modifying the on-line portion of the system which provides the user with the ability to update and inquire, via a cathode ray tube, against an IMS data base. This portion of the system is operational at both the Warrenville and Guilford Data Centers. Other locations directly involved in the modification of the batch components of the system include Atlanta, Baltimore, Oklahoma City, and Columbus. Both on-line and batch components of the system are scheduled to be in production at all Cable and Wire and Switching Divisions locations by the end of 1978.

INFORMATION SYSTEMS: Jackie Myhrberg explains to Leo Ansley the use of the new on-line terminals in the receiving area.

Statistical Quality Control Engineering

SQC engineers developed sampling procedures for several new products in 1977, including loading coils, 10-type cable stubs, R switchboard cable, straight cords, 16-type closures, 115 and G-type apparatus boxes, 94 connectors and specialty wire products.

The various quality teams met 450 times in 1977. Approximately 450 field complaints were investigated in 1977, about half originating from the telephone companies and half from Western Electric installers.

The physical and electrical, metallurgical, and cast resin laboratories on the lower level were consolidated into one area in 1977 to make room for the materials development laboratory.

Product and SQC engineers initiated a new concept in process control with the assignment of three full-time auditors to monitor the IPVC insulating lines. Initial analysis indicates substantial benefits: Scrap loss is down and production is up.

STATISTICAL QUALITY CONTROL: Left - Floyd Johnson replies to an engineering complaint from quality service management.

STATISTICAL QUALITY CONTROL: Right - John Synowicki reviews a circuit board quality requirement with the line inspector.

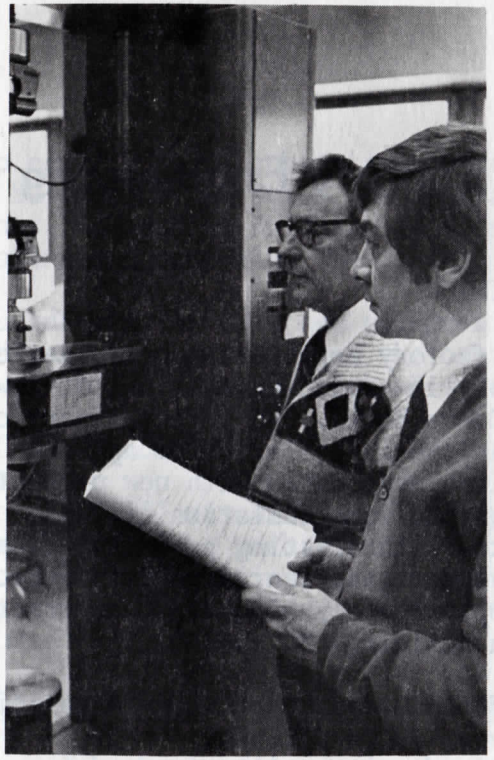
Quality Assurance Engineering

In the past year the quality assurance engineers have continued to implement several new audits for products transferred from Buffalo and for newly introduced products of outside Plant. This introduction has required extensive analysis of design requirements, coordination of new inspection practices and quality standards with Bell Telephone Laboratories, and addition of several new tests and facilities for shop audits.

The introduction at Omaha of several connectors using the split beam concept with two contact surfaces has increased the emphasis on plating requirements. To accommodate this increased sensitivity on surface finishes, the quality assurance organization has obtained a model CC-910 Betascope to provide measurements of plating thickness in the micro-inch range.

Engineering support was provided for development of a standardized audit hours forecasting and utilization procedure which would be adaptable to computer application for more timely and accurate quality assurance review. The output would be a function of production output, specified sampling curves, special sample size limitations and standard time values.

As part of the consolidation program of irradiated PVC and textile products at Omaha, numerous engineering projects were completed to accomplish the audit objectives. Coincident with these projects was the acquisition of a tensile strength and compression testing instrument, a laser micrometer and a temperature-compensating digital ohmmeter. These facilities provide increased reliability and accuracy of test results, thus allowing a more effective and efficient audit effort.



QUALITY ASSURANCE ENGINEERING: Left - Dick Barnes (left) and Jim Kresl observe a tensile test being performed on an Instron tester. Bottom - Jim Kresl calibrates Betascope plating thickness test set for a proposed audit.

Plant & Factory Engineering

FACTORY ENGINEERING

During 1977, the factory engineering organization played a major role in expanding the line of new products at the Omaha Works. An integral part of this expansion was the installation of approximately 900 machines associated with new products, and the relocation and reinstallation of 105 machines associated with existing products. The installation, movement, and rearrangement of facilities affected approximately 150,000 square feet of floor space in Buildings 30 and 50.

A partial list of facilities that were installed during the last year is as follows:

Building 30 -- Facilities for textile braiding, specialty wire and cable, 10-type cable stub, 16-type closure and 710 load coil.

Building 50 -- Central electrotinning machine, steel and aluminum slitter, tandem vinyl insulating lines, DEPIC insulating lines, and CONECS facilities.

PLANT ENGINEERING

During the 1977 standard vacation, 6,000 feet of three-conductor primary feeder cable were installed from Omaha Public Power District to the Omaha Works primary switch gear. This added two cable systems to the four existing 13,800-volt systems and was done to meet the power needs resulting from the Buffalo consolidation.

Two new 1,000-KVA substations also were added: one in Building 50 to serve the central plater and DEPIC lines, and one in Building 30 to serve the fine wire drawing and enameling jobs.

The addition of this new equipment has increased the capacity and improved the overall reliability of the Omaha Works electrical system.

MECHANICAL DESIGN

The year 1977 was an exceptionally high activity period for Plant mechanical both in the installation of support facilities for the Buffalo product and engineered maintenance. Some of the projects included:

Building HV and AC Penthouse Filters

The oil bath air filters in the 12 penthouses of Building 50 and the 28 penthouses of Building 30 were removed. Replacement filters are the two-stage, dry throwaway type. This change eliminated possible oil spills, rectified a long-standing maintenance problem and improved temperature and ventilation conditions in the buildings.

Building 50 Penthouse Temperature Control Modernization

The heating and ventilating controls in the 12 penthouses serving Building 50 were modernized by replacement of the several obsolete controls and systems simplification. This modernization along with a maintenance program involving the piping, dampers, and fans resulted in improved ventilation and temperature control in cable production.

DEPIC Ventilation Exhaust System

Cable production in the DEPIC area produces a temperature rate during the summer months which interferes with proper production control and is uncomfortable for production personnel. This is especially apparent in the area surrounding the extruder platform.

After several studies and preliminary designs, an exhaust system was installed at lines 41 through 48 to exhaust a high volume of warm air from beneath the extruder platform. Incorporated in the design was the exhausting of the smoke produced in the annealer cabinets.

Consideration is being given to install additional exhaust systems associated with the other DEPIC lines in this area.

Braiding Area - Building 30

The nature of the braiding operations dictated a closed room and the associated temperature, ventilation, humidity, and noise control. The heating, ventilating, and air cooling requirements were beyond the capacity of the existing building systems.

In consideration of the conditions to be maintained, two 50-ton roof top units were installed with associated ductwork, humidifiers, filters, controls, and auxiliary fans.

Unique in these systems is the ability to cool the area with outside air when the outside temperature is 55 degrees Fahrenheit or below and the automatic filtering of return air to prevent braiding lint from entering the air handling systems.

Enameling Machines - Insulation

In consideration of temperature and makeup air requirements of the enclosed enameled wire operations, it was determined that savings would result if the heat conducted and convected to the room by the heated enameling machines could be reduced.

After several investigations and insulation trials, 72 enameling machines were insulated resulting in a 5.5 KW reduction in power consumption per machine. This effort not only reduced power consumption for the operation, but also reduced the size of the makeup air handling systems.

Waste Treatment Plant

An extensive maintenance program was conducted in the waste treatment plant and consisted of outside tank lining inspection, pump replacement, painting, electrical, and control inspection and cleaning, safety installations, and piping replacements.

In this engineered maintenance program, modernizations were effected in the areas of improved design of pumps to suit the application, chrome destruction control, and floor coatings in previously problem areas.

Central Plater Waste Line

Associated with the installation of the central plater in Building 50, a fiberglass waste line and pumps were installed to convey caustic rinse wastes to the waste treatment plant.

A lined fiberglass pipe was chosen in consideration of the nature of the fluid waste and possible future discharges into this system. The piping is three inches in size and is located in the truss space of Buildings 30 and 50, the pipe tunnel connecting the two buildings and underground in the vicinity of the waste treatment plant. The length of the pipe run is approximately 2,800 feet.

TOOL DESIGN

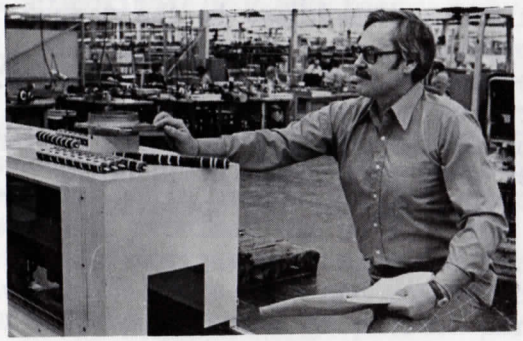
Many tools were designed for the modernization of facilities, cost reduction, and existing products. Tool and gauge orders for FDI, cutter presser, and load coil provided the bulk of the orders. Runnerless mold designs were provided for LTA products along with proto-type and conventional molding tools for increased demand of plastic parts.

MACHINE DESIGN

Significant design projects in Building 50 this year include the core repair area, revision to the plastic distribution system, installation drawings for the Northampton take-ups, and installation drawings for the central plater. In Building 30 significant projects include noise control of the braiders and braider area, and the design of the binding post finishing machine.

COMPUTER GRAPHICS

Computer graphics played an important role in handling the huge work load of the Machine and Tool Design Department. The installation of many new projects, facilities, and machines in the manufacturing shops provided a work load ideal for computer-aided technology. Drafting, design problem-solving and generation of numerical control tapes all are being done on the computer graphics system. A new, faster disc with more capacity is being added to improve efficiency of the operation.



PLANT AND FACTORY ENGINEERING: Top - Herb Weller (left) and Orv Olson at the steel and aluminum slitter. Middle - Tuck Bolton in load coil area. Bottom left - Dick Runnels (left) and Bill Wunderlich (right) in FDI area. Bottom right - Dick Christensen in 16-type closure area.

Environmental Engineering

In October 1977, one of the members of the Environmental Engineering Department became a certified safety professional. Another colleague was re-elected chairman of the Nebraska Environmental Control Council. Activity continued in various environmental concerns resulting from transfer of products new to Omaha. Improvements were made in the area of eye and hearing protection. A study was conducted that resulted in approval from the Nebraska Department of Environmental Control for the changes in waste water brought about by changes in product. Other studies were conducted and monitoring functions continued in the interest of maintaining and improving healthful surroundings for all our employees and neighbors.

Industrial Engineering

Industrial engineering covers a multitude of functions that encompass nearly every phase of Omaha Works' operations. Its primary responsibility is to develop rate structures, issuing wage incentive rates and base hours in accordance with Company policies. This organization decides whether jobs are ready for wage incentive payment, how the rate will be set, and what type of rate will be issued.

With new product lines, cost reduction emphasis and the importance of rate maintenance due to continuing floor layout and facility changes, the industrial engineer must develop a complete awareness of shop-related problems to minimize any detrimental impact on bulletin performance.

Some of the primary areas of involvement are the following.

NEW PAY GROUPS

The past year was an extremely busy period from the standpoint of new products introduced and new pay groups cut over to wage incentives. New pay groups include: scrap wire granulating operations; FDI and binding post cabinet assembly; station cords; 88 terminal block assembly, CONECS and cable stub; cabinet, apparatus box and miscellaneous sheet metal fabrication; enamel wire; 10-type cable stub; braided wire; loading coils; and fine wire drawing.

In addition, many new products were introduced into existing pay groups. They include: irradiated wire; transferred single rewind and repair; 94 connector punch press, assembly and pack; horizontal twist, new coilers, and universal spoolers; 16-type closures and kits; vault operations for irradiated wire; CONECS. All of these were accomplished while maintaining existing rate structures.

SCRAP WIRE GRANULATING FACILITY

The industrial engineering organization has developed and cut over an incentive plan for the scrap wire granulator located in Building 17 which maximizes machine output and manpower utilization. Prior to incentives, 654,000 pounds of scrap per month were processed through the granulating facility. After cut over to incentives, an average of 1,130,893 pounds of scrap per month is being processed, an increase of 72.9 percent. With the introduction of the granulating cost reduction case, the total cost reduction variation forecast was revised from $500,000 to $2,300,000. The total variation results for 10 months, ending October 1977, was $2,112,000, of which the granulator contributed $1,470,000.

The granulator's contribution to the Works' goals significantly was enhanced by the introduction of a sound wage incentives plan.

MAN/MACHINE SIMULATION STUDIES

As new machine jobs were transferred to Omaha in 1977, the industrial engineering organization has relied on computerized simulation studies to evaluate the machine intensified processes.

Simulation has been used in the past to evaluate a limited number of operations. However, with the influx of the new processes, it has become more important.

This simulation approach allows the industrial engineer to construct a model of each facility based on operation parameters, including capability frequencies and wage incentive rate values. By placing this model into a simulation environment, the industrial engineer is able to determine the optimum head assignment, machine interference, operator balance, and ultimate machine capacity for the real world environment.

CONECS (CONNECTORIZED EXCHANGE CABLE SPLICING)

The addition of CONECS as an in-house procedure introduced many challenges for the Omaha Works.

Based on the many rate combinations that could be ordered, the development data was fed into the computer for analysis. The end result was an initial issue of 213 rates, each rate consisting of six operations. Ninety days later the number of rates had risen to 738.

The Omaha Works enjoys the unique position of being the only location with rate coverage. All backup data has been furnished to all requesting locations for their use in providing incentive coverage.

Rarely were two operations identical, so each simulation study had to be tailored to fit a specific job. However, in comparison with other methods available, the computerized simulation studies provided the most comprehensive evaluation for this new work at Omaha.

BULLETIN ESTIMATES

Another increasingly important function is that of establishing bulletin estimates. Although this duty is more heavily concentrated when verifying rates for a new bulletin period, this is by no means the only involvement. Industrial engineers are asked with increasing frequency to estimate labor costs of new products, to verify existing costs, to provide cost reduction estimates and to categorize operations as base or non-base. A similar function and one which, if successful, leads to bulletin estimates, is that of assisting in the evaluation of proposals to bring other new jobs to Omaha.

LOCAL AUDITS

Another area of involvement that has come under the jurisdiction of the industrial engineer is that of local audits. A wage incentive audit ensures that rate structures, manufacturing information and existing facilities agree for the maintenance of a sound incentive system. Each pay group will be audited on a two-year rather than a three-year cycle, which is in line with the current policies and procedures of the Manufacturing Division.

INDUSTRIAL ENGINEERING: Above - Gene Valenta in the scrap granulating facility. Bottom left - Roger Jirka with a nine-foot Gantt chart and a computer simulation output equivalent to 2,000 feet of charting. Bottom right - Francis Scott takes time study of a CONECS operation.

Cost Reduction Achievements

The Omaha Technical-Professional Staff continued its winning ways in cost reduction. The engineering cost reduction program and the information system development cost reduction program combined to collect $7,700,700 and $1 million, respectively, or a grand total of more than $8,700,000. This is the sixth consecutive year the engineering staff has achieved its goal, and each time it established a new high in savings collected at the Omaha Works.

Four engineering departments achieved the million dollar "milestone" this year. A newcomer to Omaha, Department 477 (engineering for telephone cords, braiding, and specialty wire and cable), implemented savings of $1,410,900. This engineering organization and its products were transferred to Omaha with the closing of the Buffalo Plant and have put spring in our step in more than one way. Another newcomer, Department 274 (engineering for vinyl/textile cable and wire, coiling, spooling and scrap reclamation), implemented savings of $1,043,600. This engineering organization came, in part, from Buffalo with such products as irradiated wire and textile wire and was married to the Omaha vinyl products, producing a new Vinyl Cable Engineering Department at Omaha. The final two departments are repeat performers. Department 271 (engineering for cable wire drawing, insulate, and twist), implemented savings of $2,024,300. Department 273 (engineering for cable sheathing and stranding), implemented savings of $1,018,200. Both departments collected more than $1 million last year and Department 273 has achieved the million dollar "milestone" every year since 1973.

More than 200 cases were implemented in 1977, touching all aspects of our business. The savings are a result of cooperative team effort involving purchasing, operating, accounting, engineering, and information systems development, but the final responsibility of coordination, salesmanship, and design rested with engineering and the ISD organization.

For this reason, it is appropriate to recognize some of the major cost reduction efforts implemented in 1977 by Omaha's Technical-Professional Staff.

ORG.	COST REDUCTION EFFORT	SAVINGS
270	Substituted dual expanded plastic insulated conductor (DEPIC) for existing solid plastic insulated conductor	$1,969,000
470	Reduced cost of flat mounting cords by mechanizing the end-finish operations	1,037,800
470	Developed spring cord automatic machine (SAM) to produce spring cord bodies	894,900
470	Reduced the cost of plug-ended cords for modular telephone sets by developing PRAM machine	630,000
270	Reduced the cost of exchange cable through the use of single component atactic flooding compound	395,200

ORG.	COST REDUCTION EFFORT	SAVINGS
270	Replaced tin plate steel with black plate steel on ASP waterproof cable	439,300
270	Developed irradiated wire to replace "U" type DFW	528,000
120	Developed a system to mechanically report weekly attendance status based upon current and historical information of every employee covered by the Omaha absence control plan	426,400
270	Reduced manufacturing cost of textile "U" distributing frame wire	260,200
470	Provided sleeved bobbin coils for GP wire spring relays	143,300
730	Reduced cost of shipping operations and shipping cost by marriage of material	82,300
120	Modified the cable vinyl products control system to accept the transfer of Buffalo products to Omaha	79,300
120	Provided the necessary programs to provide "limited approved" storeroom status for 11 storerooms in wired equipment and loop transmission	52,600

ORG.	COST REDUCTION EFFORT	SAVINGS
120	Revised the current annual inventory system to provide on-line updating of the inventory and changing the method for calculating the valuation	45,000
120	Implemented the switching division mechanical accounting results system to produce accounting results more efficiently	46,000
120	Developed an interface system for the Omaha Works with the Material Management and Control Centers (MPPCP)	37,000

Patents, Technical Reports and Presentations

TECHNICAL REPORTS - 1977

R. R. Douglas - "Material Handling System - Small Crossbar Switch Vertical Units During Laser Welding."

The Technical-Professional Staff
December 1977

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