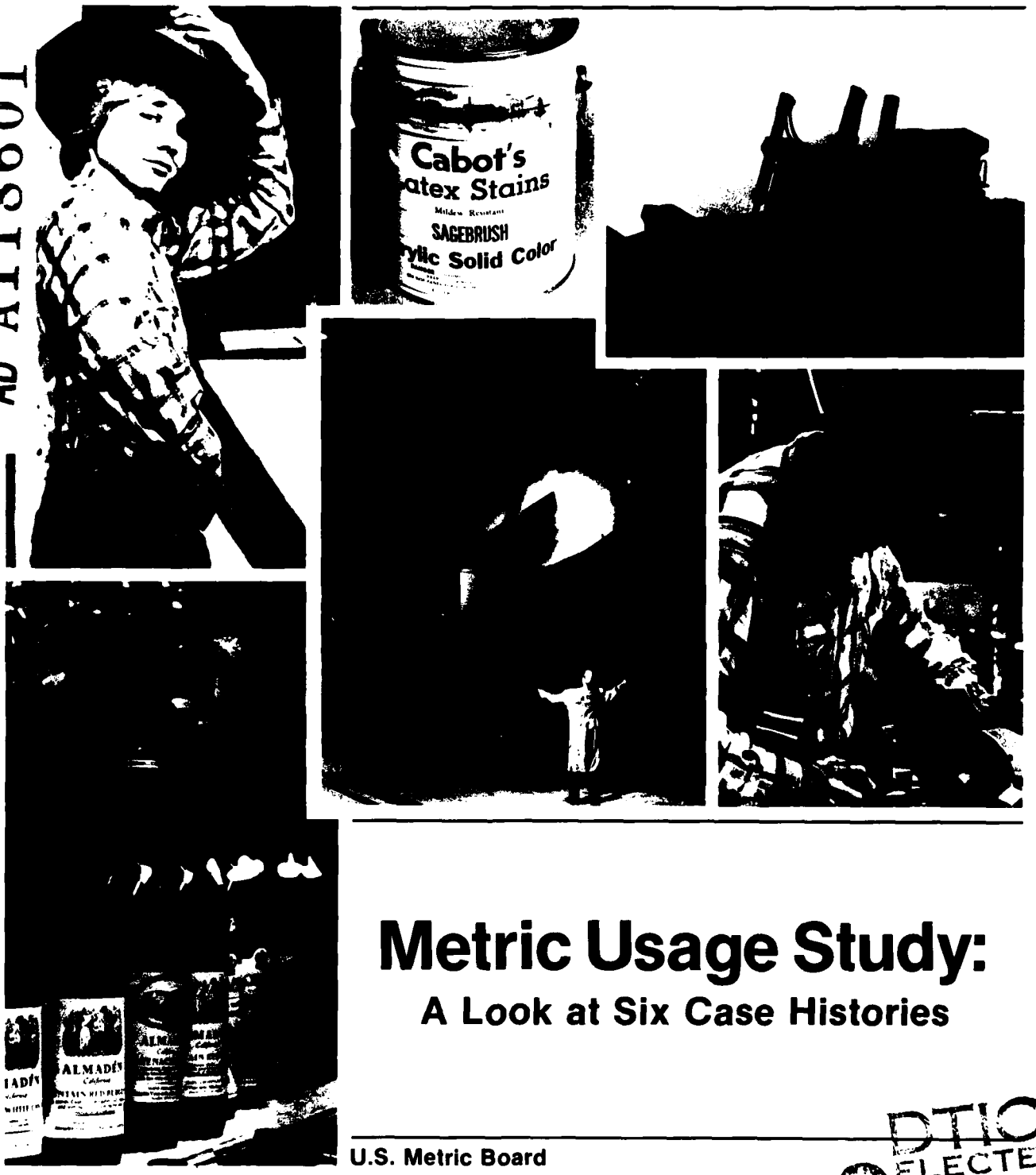

Metric Usage Study:

A Look at Six Case Histories

U.S. Metric Board

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The United States Metric Board was created by Congress to plan and coordinate the increasing voluntary use of the metric system in the United States. This study has been developed as part of the Board's public awareness and education program.

The six firms that were studied are Black and Webster, Samuel Cabot, Inc., Caterpillar Tractor, National Distillers Company, Levi Strauss & Co., and Inland Steel Company in the preparation of this publication.

Contents

INTRODUCTION

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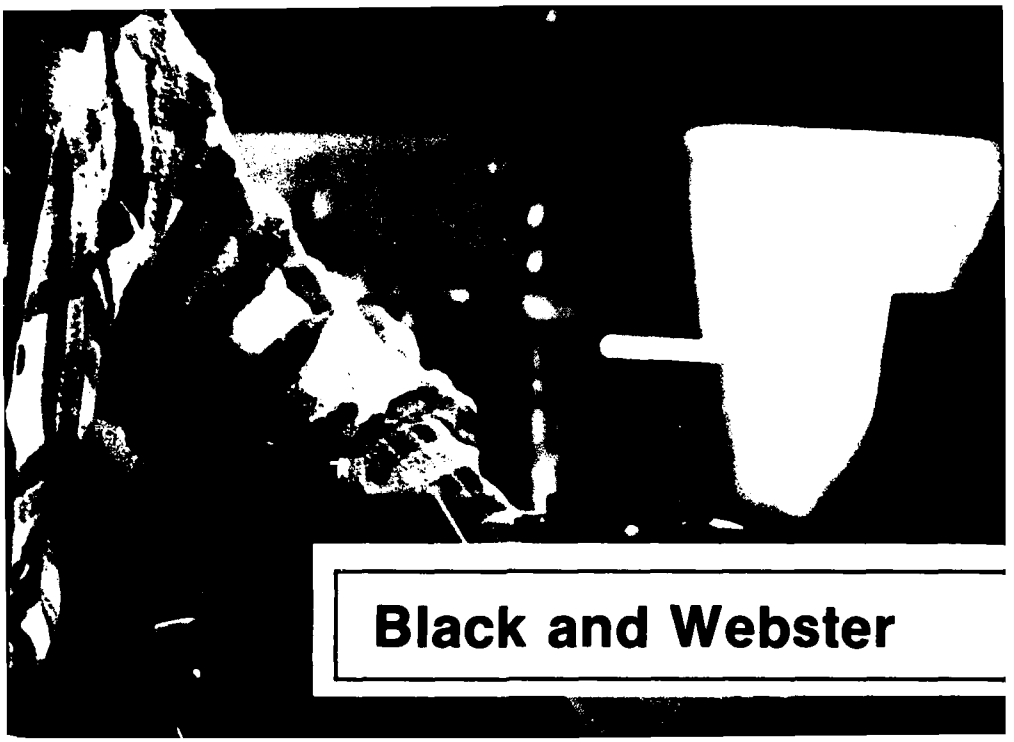
The U.S. Metric Board wishes to acknowledge the time and assistance provided by Black and Webster, Samuel Cabot, Inc., Caterpillar Tractor, National Distillers Company, Levi Strauss & Co., and Inland Steel Company in the preparation of this publication.


Black and Webster

Black and Webster: *Foreign Markets for a Small Business*

Peter Webster, President of Black and Webster of Waltham, Massachusetts, is looking for overseas markets to permit his company to continue to grow in the years to come. The U.S. market for machinery and systems used to assemble small parts—fishing reels, plastic spray handles for household cleaners, garden shears, locks—isn't growing as fast as Webster would like.

Metrication may help the firm reach foreign customers, Webster says.

Webster, whose father was a co-founder of the company in 1945, believes that Europe may provide a substantial part of this growth. So he is now directing an active marketing effort in that area.

At present, less than 5 percent of the company's $5 million in annual sales come from outside North America—primarily from Japan and Scandinavia. If the new marketing effort is successful, Webster believes this percentage could more than triple in future years.

To help his company cash in on the opportunities in Europe—and to serve current customers in Canada, Mexico, Japan, and elsewhere overseas—Webster has begun using metric fasteners in new products.

The first major change for Black and Webster came with its new line of orbital riveters. Unlike standard riveting equipment, which hammers the rivets to fasten parts together, the orbital riveter uses steady pneumatic pressure and a spinning motion to form very smooth rivet heads without the shock transmitted by conventional riveters. The new products are quieter, better suited to work on delicate parts, and produce more attractively finished rivet surfaces.

Black and Webster has sold more than 300 orbital riveters, all of them built with metric screws and other fasteners that are not interchangeable with inch-size fasteners. These have been sold to such companies as Eastman Kodak, Hewlett-Packard, General Electric, and the Delco division of General Motors. Zebco is using the metric-fastened orbital riveters to improve the appearance of rivets used on its line of fishing reels; Zebco has faced stiff competition from Japan.

The main reason for shifting to metric fasteners, Webster says, was to reduce customer resistance in Europe. While inch fasteners can be obtained in most countries, Webster wanted to reduce customers' concerns about such matters.

"We don't think that use of metric or inch fasteners will have any significant effect on our sales; but, I don't want anyone to have even the slightest qualms about fastener availability."

Webster's interest in using the metric system came from several sources. He saw that the rest of the world was either metric or in the process of conversion, and he saw—even in his own plant—that metric equipment was becoming increasingly common.

Black and Webster has Japanese milling centers and a Japanese lathe—built to metric standards. The company also buys Japanese components which are combined with other equipment in systems that are sold in the United States and elsewhere. As a result of these purchases and sales to Japan, potential business in Europe, and evidence of an international trend, Black and Webster began its progress toward metrication.

The metrication effort has not caused any problem among domestic customers, Webster reports—"None of our customers in the U.S. has made any negative comment, not even one."

Since users rarely need to replace fasteners, Webster doesn't expect the shift to produce any serious problem for his customers. "Five years ago, customers might have had some difficulty getting replacement fasteners, but now most supply houses have metric sizes available readily.

Webster says he has seen substantial improvement in the availability of metric parts from supply houses. "Five years ago, metric fasteners might have been a problem, but now most supply houses can provide either metric or non-metric taps, sockets, and fasteners."

Metric fasteners still take a little more time to obtain and cost a little more than inch-fasteners, but the company president says, "there are no catastrophic delays, even if it's still a little easier to buy inch sizes."

The company has also made a point of pur-

chasing machine tools with digital indicators that can read either customary or metric measurements. Several years ago this feature added slightly to the cost of the machines, now it is included free.

"No extra charge was made for the digital metric switch on our last five machines with digital read out," Webster says. As a result of the dual capability, manufacturing to either customary or metric standards will be easy, Webster notes.

Workers at the plant, located 15 miles west of Boston, have had very little trouble adjusting to this first step toward metrication. "We just told everyone what was happening and depended on word-of-mouth to inform our 15 production people and the seven or eight people in assembly" Webster recalls. "Only two or three men really need to use metrics—and they were born in Europe anyway. We really haven't seen any need for a formal training program."

Occasionally, Webster notes, employees have confused metric-size hex wrenches with the U.S. size wrenches. The wrenches look virtually identical.

Cost has been a major factor in Webster's decision not to convert all of his equipment to metric fasteners. "For the time being, we will continue to sell equipment with inch fasteners; we can't afford to spend the $100,000 it would cost us to make the changeover." Since the greatest portion of the company's costs would not be for capital improvements, it would show up on the balance sheet as an expense and would wipe out a year's profits.

"As the volume builds, we'll decide when we can afford to spend the money for new taps, drills, reamers, and fasteners—about $50,000 worth. The rest of the money would go for retooling. Since we use numerically controlled machine tools, this cost will be less than might be expected otherwise," says Webster.

Further conversion will also have an impact on the company's skilled machinists. Since each of the machinists has purchased his own set of tools, Webster fears that he might lose some employees if he were to shift to metric measurement while other companies continue to use customary units. Rather than buy a new set of tools and learn the new system, some machinists might leave for other firms.

On the other hand, if the company were to pay some portion of the cost for metric tools, this would raise the cost of conversion of the small business.

Webster hopes that the Federal Government will take a more active role in the conversion, to assure that small businesses like his are not at a competitive disadvantage as the result of conversion to the metric system. But with or without such support, Webster believes that metrication will continue in the United States and that his company's foreign sales will benefit by the changeover.


Cabot's
atex Stains
Mildew Resistant
Samuel Cabot, Inc.
BRUSH
ylic Solid Color
ANGER – HARMFUL OR FATAL IF SWALLOWED
KEEP OUT OF REACH OF CHILDREN.
SIDE PANEL FOR FURTHER DANGER STATEMENT.
4 LITERS – 1.057 U.S. GALLONS

Samuel Cabot, Inc.: *Road to Metric Still Too Rocky*

Samuel Cabot, Incorporated manufactures paints and stains. It has been doing so since 1877, packaging its products in the standard customary containers—pints, quarts, and gallons. In the fall of 1973, an attempt was made to convert to metric-size containers. This change was primarily the result of an increase in foreign markets. Oddly enough, though, Cabot Inc. changed to metric after first encountering the old "imperial" measurement system.

The company—based in Boston, Massachusetts—first developed foreign business after World War II, from Canada initially. To accommodate this new market, Cabot Inc. began to "dual label" contents using the imperial unit system that Canada at that time followed. Containers shipped north of the border, though still in customary sizes, bore labels that read: "one U.S. gallon = 5/6 imperial gallon." There never was a need for "hard" conversion to imperial gallon size cans—the U.S. sizes were accepted and widely circulated throughout Canada. There were, however, occasional complaints that the cans were not big enough.

Export business picked up during the 1960's. Cabot Inc. acquired distributors in Germany and Australia who developed substantial markets—foreign sales rose to 20 percent of total sales. Other markets also opened up—Thailand, Nicaragua, the Dominican Republic, and South Africa, to name a few.

Cabot "Meets" Metric

Expansion into these areas brought Cabot Inc. face-to-face with the metric system. Retired company President Samuel Cabot, Sr., explains, "It was rather forcefully brought to our attention that these countries use the metric system and that it would be appreciated if the contents were given in metric units. In some nations, it was actually required to at least dual label with metric measurement."

Accordingly, Cabot Inc. revised its labels to read "one U.S. gallon = 5/6 imperial gallon = 3.785 liters."

By the early 1970's, metric usage in this country was increasing. A metric conversion bill had been passed by the Senate and, though the House of Representatives failed to take action on it, it was expected to pass both Houses when reconsidered in early 1973. (It did not pass until 1975, but, nonetheless, there was considerable metric activity in this country at that time.)

Also during that period, Cabot was getting more and more requests from his overseas customers to package their orders in metric containers.

To Samuel Cabot, it appeared that metric usage was just around the corner in the United States.

Cabot thinks that "soft" conversion (stating metric on the label but keeping the customary size) is "an unsatisfactory way of going metric." Thus, since a change to metric appeared inevitable, he decided to issue a sales bulletin to his salesmen and customers to sound out their opinions on "hard" conversion to metric-sized containers.

Traveling the Metric Road

The number of responses was substantial. Very few were noncommittal. Opinions were either strongly for or violently opposed to a change. Commenting on this diverse reaction, Cabot remarks."One chap said it was a great idea—a real step forward; while another claimed it was 'looney and unAmerican.' People are either strongly for or against metric, very few are on the fence." A majority (57 percent) favored the change, so Cabot decided to make the move.

The company did not experience personnel familiarity problems in its conversion to metric. The change was made gradually enough that, according to Cabot, "they took it right in stride and got used to thinking in metric terms."

The first problem the company encountered was finding a supplier of metric containers. One of its regular manufacturers agreed to provide metric-size cans—if Cabot Inc. ordered in lots large enough to make a full-production run (three carloads). This was not an unreasonable prerequisite, but it did create somewhat of a problem for Cabot, who admits, "it had its disadvantages in that we got locked into one single source of supply. If we

started to run short, we couldn't draw new cans from a manufacturer's stock—we had to wait until our supplier could start another metric production run. This often delayed us for as long as 5 weeks."

The metric cans were the same diameter as the customary sizes, but they were slightly taller. This created apprehension among dealers, who worried that the new cans would not fit on their shelves. This was a logical concern but one that, as far as Cabot could tell, never materialized into a problem.

Labeling was the next item affected by the switch to metric. New labels were needed to reflect the metric size can, with the equivalent customary dimension following, for example—4 liters = 1.057 U.S. gallons. Cabot Inc. also needed to obtain new, larger cartons to accommodate the taller containers and to state the contents properly—"four 4-liter cans" or "six 1-liter cans."

The company had no trouble adjusting its machines to handle the larger packages, except for one labeling machine that could not be widened enough for the 4-liter label. This obstacle was overcome easily enough by acquiring a labeling machine from Cabot Inc.'s Canadian affiliate. Designed to accommodate imperial gallon labels, this machine could be adjusted for the smaller 4-liter labels with a few turns of a wrench.

Although the labels on these metric-sized containers gave the contents in metric, the covering capacity remained in customary measurement—listing, for example, 400 square feet per gallon rather than 9.3 square meters per liter. Commenting on this policy, Cabot explains, "We decided not to make that change because we felt that it would be too drastic a switch for our American customers. It would be enough to get them to accept the new containers without having to wrestle with metric areas."

This concession to the American market was also evidenced in the listing of temperatures—with the customary figure first: "apply only at temperatures above 50 degrees Fahrenheit (10 degrees Celsius)."

According to Cabot, the first beneficiaries of the new policy were the company's distributors in Germany and Australia, whose orders were converted to metric in the fall of 1973. The change was particularly timely for the Australian market—that government had recently decreed that all measures must be metric by June 1974. In Germany, sales increased to the extent that Cabot Inc. provided labels in German for those customers.

There was some inconvenience involved in dealing with overseas markets. For example, the government of Thailand insists that each packaged item define its contents in the native script. Since Cabot Inc. could not easily print labels with the drastically different alphabet characters, its dealer in Bangkok would send back long coils of labels, which then had to be affixed to each can in every carton. According to Cabot, it was "a confounded nuisance." This procedure was subsequently changed, however, to using a rubber stamp that was also sent from Bangkok, with the appropriate script.

This problem did not occur in Germany—since they supplied the necessary information from which Cabot Inc. could produce and affix the labels at its own plant before the cans were put in cartons. For the Australian market, Cabot Inc. sent concentrates of its products in 20-liter pails, which the dealers then put in their own containers.

Cabot Inc. changed to metric packaging in the United States after "the ice was broken" in foreign markets. The conversion was announced in a sales bulletin dated December 5, 1973.

The move received little comment. Several of those who had opposed the change "sounded off" about it, but, according to Cabot, "basically, most just accepted it as the new policy." As far as customer comment, Cabot remarks, "most of them didn't give a hoot. They went right on ordering quarts and gallons and receiving liters and 4-liters—and the containers were so close in size that they were not aware of the difference." There were no complaints, whether the change was noticed or not.

Cabot Inc. increased prices in direct correlation to the size differential, multiplying everything by 1.057. This also caused no problem, explains Cabot, "in 1974 and 1975 the price situation was chaotic anyway, so a 5.7 percent increase went unnoticed."

Another area impacted by the change to metric concerned a small specialty product called Plasgon, a plastic pipe joint cement and adhesive sold primarily in the plumbing supply and textile machinery fields. Plasgon was sold in 2-ounce and 6-ounce tubes; Cabot Inc. changed the 2-ounce size to 60 grams—approximately 2.1 ounces—and the 6-ounce to 180 grams—or 6.3 ounces. Unlike the paint can labels, the Plasgon packages were completely metric-first/customary second—even the temperature, which was listed as "resists heat up to 150 degrees Celsius (300 degrees fahrenheit)." The

acceptance to this change was also good; says Cabot: "Our Plasgon customers appeared to accept the new sizes and, more often than not, specified metric measure on their orders."

Turning Back to Customary Sizes

However, even though Cabot Inc.'s conversion was met very well in the foreign markets and well enough in the American, the nonmetric reality of its supply sources created too great of a handicap for the company.

According to Cabot, "We were locked into one sole manufacturer for our containers. The cans were approximately 6 to 8 percent more expensive, and the supply was at times unreliable." Cabot attributed this cost increase to the "metric" cans being a little larger and to the fact that they were not standard size items at the manufacturer. More critical than the cost increase, though, was the availability factor. Cabot explains that a paint company cannot afford to wait 5 weeks for containers—especially in the busy spring and summer seasons when the demand for the product is at its greatest.

Eventually, the handicap this created caused Cabot to abandon his metric program and reluctantly return to customary container sizes. Whatever metric-sized containers remained were sold; so, for all intents and purposes, Samuel Cabot Inc. is back to customary pint-gallon measure.

The one exception is the Plasgon—which will retain its metric containers. There is no problem in obtaining metric-sized tubes and, since Cabot favors metric anyway—the company plans to continue using it with Plasgon.

Returning to customary sizes brought little response, even from foreign dealers—the majority of whom bought in bulk and recanned. Any "measurement system legalities" were taken care of by dual labeling. In fact, the company just recently received new rubber stamps from its dealer in Thailand—stating customary sizes—to replace the metric versions.

Cabot comments that sales were not directly affected to any extent by use of either measurement system. Sales have continued to rise every year—last year saw a new record established with total sales of $7 million.

But Samuel Cabot wanted metrication to work at Cabot Inc. He thinks that metric usage is inevitable in this country—though "America has dragged her feet shamefully"—and he thinks hard conversion is "the proper approach."

The problem Cabot Inc. had with supply parts is one that concerns many companies considering metric usage. Obtaining these goods—whether they are paint cans or other small parts items—can be difficult unless there is an established or an imminent demand for them.

Cabot says that his experience confirms the advice of the poet, Alexander Pope:

"Be not the first by whom the new is tried,
Nor yet the last to lay the old aside."

Caterpillar Tractor

Caterpillar Tractor: *Worldwide Standardization*

A news article in the Wall Street Journal set Caterpillar Tractor on the way to metric conversion of its U.S. plants.

The newspaper reported on July 30, 1971, that Commerce Secretary Maurice Stans had recommended the creation of a central coordinating body to guide the United States through a 10-year conversion to the metric system of measurement. A copy of the article reached William Blackie, Caterpillar's Chairman of the Board. Blackie read the item and wrote a note to President William Franklin, accompanied by the article, asking that consideration be given to starting immediately to convert plants in the United States.

The result was a decision in November 1971 to start conversion of U.S. plants in a slow, orderly, systematic way that would eventually provide one common system of measurement throughout their worldwide operations, since all non-U.S. plants were either already metric or in the process of converting.

Cartepillar Tractor, with more than $7 billion in sales the previous year, had made substantial progress toward the use of the metric measurement system by mid-1979. The corporation now buys metric steel and prepares new engineering drawings in metric dimensions. Its company magazine, Caterpillar World, reports everything using metric measurement only; and the annual report to stockholders carries measurements in both metric and customary units.

"But," says Louis Strang, Supervisor of Basic Standards for Caterpillar, "the average person at Caterpillar probably isn't aware that the company is going to the metric system unless he has job involvement. We don't try to educate employees who aren't going to use the system."

Top-level management, too, still gets much of its reporting in customary units to overcome a communications problem that is almost non-existent with lower level personnel who work with metric units daily. To help accustom managers to the everyday use of metric, color photos of "Cat" equipment with familiar statistics noted in metric have been produced. These mental benchmarks may help managers work comfortably with metric units on a regular basis.

International Manufacturing

The clear trend toward use of the metric system worldwide and Caterpillar's use of standard designs manufactured at plants in several countries helped persuade the company to begin its conversion.

By beginning its conversion to the metric system, the company could use a common measurement language throughout the world; and, it could make the conversion at its own pace—rather than in response to outside pressures. Most company officials felt that the cost of conversion would be higher in the future and that the conversion might offer some savings that could be obtained very early in the process. Since management was convinced that the metric system would inevitably be adopted in the United States and in the few other non-metric countries remaining, they also felt that the company might benefit by taking an active role in creating new basic standards for American industry.

Until Chairman Blackie set the wheels in motion toward metrication, the company had created its designs at the corporation's U.S. facilities using customary measurement. Since these designs had to be built in plants around the world, each of the metric non-U.S. plants had to convert the drawings to metric. The cost of conversion and the potential for confusion and error was significant.

Metric Policy Committee

As a result of the interest expressed by the corporation's chief executive, a metric policy committee, headed by Manufacturing Vice President George Armstrong, began formulating basic policy to guide the company's actions. In a matter of months, the committee had established the core policies for Caterpillar's conversion and the engineering department began to design new product models using the metric system.

The policy committee established a number of specific policies to guide the company's metrication effort. These include the following: (1) new models will be designed in SI (Systeme International) metric. (2) Old drawings will not be

changed. (3) Metric standards will be adopted whenever they offer an improvement in product or an economic advantage through improvement in cost, availability, or serviceability. (4) Data to permit conversion to customary units will be included on drawings during a transition period. (5) The ability to manufacture to either metric or nonmetric standards will be developed in the shops. (6) When parts are shown in metric on a drawing, they will be processed in metric to increase the use of metric throughout the company. (7) Employees are required to furnish at their expense a set of commonly used tools referred to as "personal tools"; however, a second set of measuring tools required to work in both systems of measure will be provided as required to shop personnel at no cost. (8) Metrication will proceed as fast as possible without disruption of business and without unreasonable expense.

The initial policy decisions did not provide the company with a detailed schedule of goals to be accomplished. These details were worked out by the appropriate operating departments.

"We don't have specific dates in most areas," says Strang, "but we did say that conversion to metric plate steel should be completed by the end of 1979. And, after including conversion data on our drawings since 1971 (by mutual agreement of manufacturing and engineering), we decided that we would stop providing conversion data at the end of 1979."

From time to time, Strang says, a department such as manufacturing or engineering may propose a specific action to management in an area that will affect the company's metric posture; but, there is no detailed timetable for future metric action.

Once the basic policy was established, the committee itself became largely inactive. Caterpillar has no central coordinator. Personnel in the corporation's engineering standards department attend to the basic elements of the continuing program, and ad hoc committees oversee specific changes. Most metric problems are handled in the same fashion as other day-to-day operating problems.

Since then, the company's progress in building plants that use metric measurement almost everywhere and its use of SI metric units in designing new products have been clear evidence that the metric policies are being implemented effectively.

"About half of our current drawings are in metric—and virtually all of the new drawings we've produced since 1977 are metric. Altogether we have approximately half a million drawings in our system—approximately 200,000 of these are for current vehicles, with the remainder for parts. We expect 100,000 of our current product drawings to be metric by the end of 1979," Strang says.

No Metric Fasteners

One area where Caterpillar has not introduced metric standards is fasteners—bolts, screws, and nuts. Since the company uses only inch fasteners throughout their worldwide operations, management decided against converting to metric fasteners to avoid having to carry dual inventories.

"Parts for our tractors are serviced for approximately 25 years, and we may go 10 to 20 years before we completely redesign a model. So, for up to 50 years after we started a change we would have to stock both metric and inch fasteners." Strang adds, "There isn't any product improvement in converting to metric fasteners, common worldwide standards for metric fasteners are still in the making or paper stage, and metric fasteners aren't any easier to obtain in most countries than inch fasteners. Under these circumstances, we can't see any reason to go through the expense of a change in this area."

Strang says that the current lack of acceptance of uniform worldwide metric standards for fasteners eliminates the usual argument for standardization, and that good availability of inch screws, nuts, and bolts exists overseas in part because they are produced there for sale in the United States. In any case, he adds, most of Caterpillar's customers tend to return to their dealers for fasteners rather than buying them on the open market.

"Not every business would have the same situation," Strang admits. "In the automobile industry, for example, the product is in service for fewer years, models change more frequently, and the customer is more likely to buy fasteners from a local hardware store than from the automobile dealer."

Caterpillar's decision to use only inch fasteners and to insist that inch fasteners be used to attach purchased components to their products has created a few problems. For example, General Motors' Delco division builds alternators for Caterpillar's diesels. Since GM has switched to metric fasteners, it no longer wants to carry inch fasteners—since this would require dual inventories and could produce confusion and error on the assembly lines.

For the same reasons, Caterpillar wants to stick with inch fasteners on their assembly lines, though

it doesn't object to the use of metric fasteners inside supplied components.

Ways to solve the dilemma are being explored. One solution is to use through-holes in the purchased component that would permit mounting with either a metric or an inch bolt. Meanwhile, Caterpillar closely monitors the fastener situation for changes and trends that might affect its position. Further, it takes an active role in standards making bodies in the development of both inch and metric fastener standards that can achieve worldwide acceptance.

Transition Not Difficult

Although no one expected serious difficulty in converting to the metric system, in many areas, the process of metrication has been much simpler than was expected by most of those who helped establish the initial policies.

"The change was far easier than I had expected," Strang says, "I don't think it was anything we did—it's just that our apprehension of something new proved to be far greater than was appropriate."

"Our plants in France, Japan, and Belgium have been metric since they started in the 1960's," he says, "so we were able to learn from their experiences and those of our U.K. and other inch-using plants whose metric conversion preceded the U.S. plant conversion.

Joe Langenstein, who works for Strang, says that there is occasional resistance to specific decisions from some of the company's 28 plants in the United States and 9 other countries. This has been defused, though, by the strong support for metrication from the top of the company and by employees' awareness of the importance to Caterpillar of export sales.

Caterpillar employs some 25,000 American workers, about two-fifths of the company's total U.S. employment, in producing products for export. Its export business brings revenues of nearly $2 billion annually, making the company one of the largest industrial contributors to the U.S. balance of payments. Caterpillar sells to customers in more than 140 countries.

Strang says, "The big hullaballoo about changeover to metric in the production shops isn't a reflection of what really happens. We provided conversion scales to aid operators in making machine dial adjustments. Unless we are buying a new machine, we don't change the machine itself at all. Machine operators have to buy their own set of personal measuring tools; but, if an operator needs to have a second set to work in both measurement systems, the company provides the extra tools."

Since the company agreed to provide the additional tools—at a cost of approximately $100 for micrometers, vernier calipers, and scales for those workers who require them—there has been no opposition to metrication by the United Auto Workers or the International Association of Machinists, the two unions that represent most of the company's U.S. hourly employees.

"We didn't do any real cost study at the beginning 8 years ago because everyone agreed the conversion was inevitable. Our instructions were simply to convert, at the least, cost and to avoid disrupting operations," Strang reports. "We did a cost estimate for the 1968-1971 Department of Commerce study," Strang says, "but the criteria established were not at all realistic, and the numbers really didn't mean anything.

"You could easily spend a great deal of money in going metric if you just adopted all metric engineering standards that define size of components or features without regard to their impact. From the beginning, Caterpillar's strategy was to metricate at the least possible cost, and wherever possible this meant changing to new metric engineering standards only when we could improve the product or gain some other benefit," Strang adds. A major advantage occurs when the change to a new metric engineering standard allows the immediate elimination of the inch standard it replaces.

One example of an area where the metric standard permitted either improvement or savings was in the purchase of plate and sheet steel. As part of the changeover to standard metric thicknesses, Caterpillar reduced the number of thicknesses of steel plate and sheet used in its products, thus cutting the number of sizes required in inventory. In some cases the company was able to use thinner material, permitting a reduction in cost. In other cases, it selected thicker steel to increase durability. As metric thicknesses were introduced, the comparable inch size was eliminated in both old and new products.

Training

Training Caterpillar's employees to use metric has required very little additional effort. At the beginning of the conversion, Strang says, engineers

were given approximately 2 hours of orientation, primarily to explain why management had chosen to convert. Later, after the initial apprehension about the system was dispersed through experience, Caterpillar eliminated the training sessions for engineers.

"It's a much easier system, and the schools have been teaching it for the most part, so we really saw no need to continue special training," comments Strang.

For machinists, says James Blass, Training Instructor at Caterpillar's Technical Center near Peoria, Illinois, a course in metric is the first step in an apprenticeship. The only problem so far, he notes, comes from the machinists having to go back and forth between metric and customary measurement.

Gary Meisenbach, a machine operator at the Tech Center, said he was skeptical of the new system at first, after doing his work with customary units for 10 years. "Now," Meisenbach says, "I'd rather work in metric—the tolerances can be closer because the calibrations are smaller.

Meisenbach says that sometimes he has to convert a metric drawing to customary units because a special metric measuring tool needed for the job is not immediately available. The company does keep a variety of seldom used tools in tool cribs, but some very specialized metric tools are not yet available at all locations.

On the average, Meisenbach says, it takes about 15 minutes for him to make the conversions on a drawing. "I'd rather have everything in metric so we don't have a flip-flop back and forth. I like it real well."

Since the Tech Center builds many prototypes and one-of-a-kind items, it has lead the way in converting to metric measurement. The machines have new digital readouts that can be changed from customary to metric measurement by flipping a switch. Still, some machines have calibration in customary units and because of the long lifetime of large machine tools, they will still be in use for many years to come.

"We don't make changes except when we are replacing a worn-out tool—unless there is an economic benefit that justifies the added tooling cost," Strang comments.

New Metric Plants

At Caterpillar's new diesel engine plant, opened in late 1978 just outside Peoria, Illinois, yellow dials are used to designate equipment that measures in metric units. Torque wrenches measure in newton meters, pressure gages in kilopascals, and most of the other instruments in the plant are calibrated in metric units. The facility is largely metric, as are all new plants (e.g., the one under construction in Lafayette, Indiana)—but customary units are still used to make some measurements where metric devices are not readily available from suppliers.

Although the situation has improved markedly since Caterpillar decided to begin moving toward the increased use of the metric system, there are still many areas where metric materials and equipment are not readily available.

"In the early stages we had a lot of trouble getting metric equipment. Drafting scales, for example, had to come from Australia. Now, most of the essential measuring equipment like micrometers can be bought in the United States—if you don't mind waiting," Strang observes.

Caterpillar's suppliers, too, have had some difficulty with the change.

"We've been designing in hard metric material sizes for some time now," Strang notes, "but our suppliers of Caterpillar designed parts have been having a problem finding round and flat steel bars in metric sizes. These aren't stocked by most warehouses now."

Caterpillar has taken two steps to improve the situation. Through the American National Metric Council, Caterpillar is participating on a committee including representatives of companies using metric steel and the steel warehouse association. The objective of the committee is to communicate to the warehouse industry the sizes and chemistry needed by users so that they can be stocked in warehouses.

Second, as an interim step, the firm has ordered metric steel bars in the minimum quantities acceptable to the steel companies. Stocking such materials may provide sufficient quantity to fulfill requirements for many years, based on current needs. However, these sizes are promoted for use in new designs and in some instances the material is sold to parts suppliers when their requirements are too small to justify a minimum mill buy and when material is not available from warehouses.

Strang says the lack of supplies means that the largest U.S. companies will have to take a lead in the conversion to metric, since only they can order quantities large enough to be economical.

So far, metrication of steel has brought significant reductions in cost, though company officials

point out that the same reductions might have been achieved without metrication. In its conversion to metric plate and sheet, for example, the company was able to select 43 standard metric thicknesses for use in its products. Until the changeover, Caterpillar had stocked 70 different customary sizes.

By reducing the number of sizes, the company cut the effort required to order, process, and store steel sheet. As part of the same changeover, the company also instituted a computerized program to select optimum sizes to reduce the amount of waste from each purchased sheet.

This increased standardization was stimulated by the metrication effort. When the company carries out a similar effort to eliminate some of the hundreds of sizes of flat and round steel bars, additional savings may occur through reduction in the number of sizes and chemistries. Up to 60 percent of the sizes now used may be eliminated as part of the move to metric.

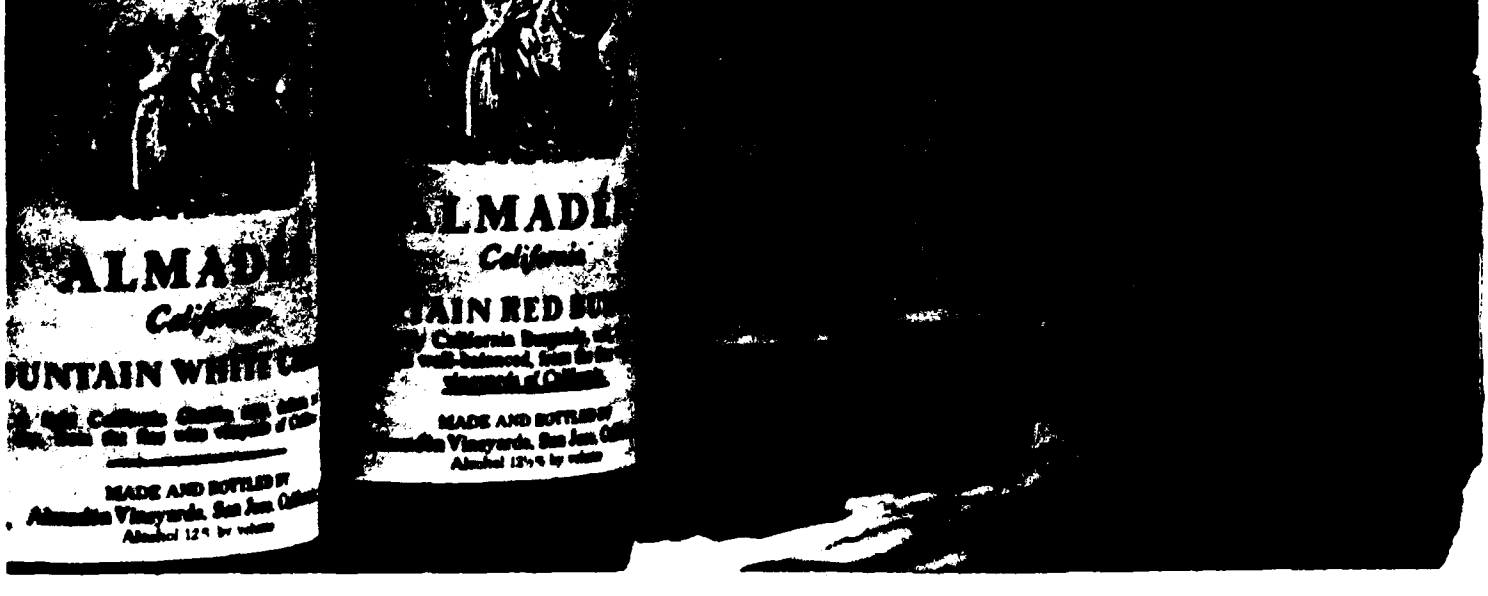
"The continuing savings in conversion to metric steel alone should come close to paying for the entire conversion effort," says Strang.

After 9 years of working slowly but surely toward the increased use of the metric system, Caterpillar officials remain committed to the program established by the first policy meetings: steady progress at the lowest possible cost and where it will be most beneficial to the company and its customers.

Now, Strang says, he is anxious to see what steps the U.S. Government will take to help speed up the overall process so that the nation won't be forever forced to continue with dual measurement.

"How long," a company report asks, "can we as intelligent Americans with a background of common sense and efficiency, continue to work in two systems, teach our young people two systems, dual label products, or develop standards in ideal modules of both systems. Doesn't it make sense to have one system? Shouldn't the government take a more positive approach toward metrication?"

National Distillers Products Company



National Distillers: *Wine and Liquor Go Metric*

"Our company and most others supported the conversion to metric in the government hearings," says Ronald F. Van Vactor, Vice President and Director of Sales Promotion for National Distillers. "Our industry trade associations, both wine and liquor, asked the government to make this move."

Van Vactor, who acted as metric coordinator for National Distillers, says that conversion was never expected to be either easy or pleasant.

"We knew it would be difficult, costly, and temporarily harmful to the business," says Van Vactor, "but there was a general consensus that it was inevitable, and it would be better to do it in a sensible, coordinated manner than have it forced on us later."

The conversion did appear to offer some benefits, says Van Vactor. "It gave us a chance for commonality with the world—we both import and export, and the proliferation of bottle sizes had become a serious problem. In the long run we felt that we might help hold down prices by limiting the number of bottle sizes." These goals have been realized, in part; but, Van Vactor feels the consistency of the new sizes is the clearest benefit.

Under the regulations of the U.S. Treasury's Bureau of Alcohol, Tobacco, and Firearms (BATF), which controls the sale of wine and liquor in the United States, the 3-year period for conversion of liquor production to metric ended on December 31, 1979. The wine industry changeover preceded spirits by a year.

Once the conversion was mandated by the Federal Government, National Distillers began the change promptly. By making an early start and by staggering the startup of the various metric bottle sizes, Van Vactor notes, "We did face difficult problems at first, but on the whole our company has an advantage over competitors who now must do it quickly.

The company had an energetic planning effort, followed by close coordination and an aggressive communications program. "We tried to be intelligent about the problems throughout our business, from our own people to distributors to package stores to institutions to consumers," Van Vactor says.

Our company formed a task-force committee to tackle this immense project. We've got piles of recommendations, strategies, feasibility studies, engineering work—going back to the period when the government was holding hearings," Van Vactor remarks. The liquor conversion benefited by the early experience with wine. National Distillers also did a survey of stores, distributors, and consumers to guide the company's planning.

The company made its initial introduction of the new program at a distributors' sales conference, sending out letters listing the benefits and problems of metrication, providing newsletters, formal schedules, and even metric Christmas cards just before the first shipments went out in January 1977.

During the conversion period, the company produced news releases, conversion cards, metric notepads, a variety of sales tools, and special tags and labels for bottles and boxes.Company officials held interviews with national print and broadcast media to discuss the changeover. Contests using metric information were held for the sales force.

Regulatory Nightmare

Because the Federal Government mandated the conversion, the competitive barriers to the change were virtually eliminated. No company could attempt to profit by staying with customary sizes while others made the shift. But serious administrative problems were presented by the 50 states and one county in Maryland that also regulate the most minute aspects of the sale of liquor.

"The level of detail is tremendous," says Van Vactor. "In some states, each change in bottle size required an act of the legislature. Our company had to devise a flexible system that would permit conversion to metric at a time when some states had anti-metric laws and when others had non-metric inventories."

"We can't sell direct to retail accounts, and we don't establish the retail prices. Proper 'pass-through' of new retail prices (both up and down on adjusted sizes) has been most difficult. In addition, prices and labels had to be refiled with 51 regulatory bodies. It's a mess—and you can quote

me," Van Vactor comments.

A great deal of time was required to explain to each of the regulating bodies what changes were necessary and why, and considerable effort was expended to speed their actions.

"The states are not always aware of the problems of suppliers. We—and our industry supplier associations—used pleading, reason, and persuasion to get states to take the necessary steps," Van Vactor recalls. "Because we were early, National Distillers had to do some of the spade work." The BATF helped too, with written and telephone communication to the various states.

Conversion Costs Reach $5 Million

The conversion cost the company an estimated $5 million. Engineering work, primarily changes on the company's 30 bottling lines, cost approximately $3 million. Another $800,000 was spent for new artwork and plates for the firm's 1,480 different labels. Changes to computer programs cost $250,000 more. Parts that could not be salvaged, valued at $200,000, had to be scrapped as a result of the conversion. Temporarily shutting down production lines has cost $175,000 so far, with two of five size changes left for conversion in the last half of 1979.

Van Vactor says he believes that metric bottle sizes would make price comparisons easier for consumers, and that a reduced number of sizes would simplify production. So far, the latter goal has been realized; but, the number of non-metric bottle sizes still on the shelves makes price comparisons more complex.

"We know that we suffered some business losses because of mispricing and errors in comparison pricing. Our business has improved, but despite this problem," Van Vactor says. He credits careful planning with keeping the costs of the conversion at a modest level—about one-third of 1 percent of total sales during the 3-year period. "We think that net cost was kept as low as possible, with internal coordination of sales, marketing, accounting, purchasing, manufacturing, and other affected departments."

Liquor Price Increases

While retail prices of some products may have risen during the conversion period, Van Vactor says that metrication was not responsible for any significant change. He does believe, however, that the changeover may have cost the company as much as $1 million in profits during the transition period.

"Recent price changes," Van Vactor says, "reflect rocketing increases for materials—glass, corn, wheat—and for labor and trucking. None of this has anything to do with metrication."

"We don't control prices at the retail level, but we did reduce our own prices whenever we reduced sizes and we raised them when we increased sizes. I think most of the industry stayed pretty close on prices. Unfortunately, when bottles are made 6 percent smaller, we don't save 6 percent on the cost of labor to pack a case or 6 percent of the cost of shipping the case," Van Vactor observes.

"In general," Van Vactor notes, "liquor prices have gone up only about 12 percent in the past 10 years." The heavy regulation by states makes it virtually impossible for a company to make unjustified price increases.

"The state of Pennsylvania requires us to provide written affidavits to justify any price change, and most states have laws that require they receive the lowest price available anywhere," Van Vactor says. As a result, only fully documented increases in cost are reflected in the prices paid by liquor consumers.

Worldwide Uniformity

The conversion to metric measurement was expected to bring about worldwide uniformity in the sizes of liquor bottles sold, but this goal has not been fully achieved. "We've gotten closer," says Van Vactor, "but the matter is not completely resolved. There is more consistency, but not complete uniformity."

"Canada," he says, "has decided not to go along with the U.S. size designations. We've worked with the European Economic Community, but they too, have some variation." Among the problems—export production will continue to be in different sizes than approved for U.S. marketing to satisfy the regulations of foreign countries. This is true for Scotch producers in the United Kingdom, too, who also export world-wide.

Van Vactor says he feels the accomplishments in converting to metric measurement are something of which the company and the entire industry can be proud. "We think we may have helped pave the way for other metrication, because liquor is associated with pleasure and its purchase is a matter of

choice. This should provide a favorable association that will be a bridge to other products."

"We got the Federal Government, 51 state and country regulators, thousands of distributors, and hundreds of thousands of stores and institutions to accept the change. Consumers are a final step, but, in our industry, '750 milliliters' is already used in place of a 'fifth' without thinking about it," he says.

The conversion is not yet complete, but Van Vactor says his company can see the end of the problems that accompanied this "nerve-wracking change." "Except for disposing of the remaining supply of U.S. sizes, we should be finishing up by early 1980," he says. "The slower moving stock in our last change—from quart to liter—may not reach retail shelves until March 1980."

"Other companies may be later than this, shipping U.S. sizes from distributors into early 1980," Van Vactor reports. "Schenley, one of the bigger suppliers, has held off converting most of their brands/sizes to date. With only a few months left before mandatory change, they may have a very difficult time coping with the complex mechanics of total conversion."

Almaden Vineyards

The experience of National Distillers' spirit business is similar in many ways to that of Almaden Vineyards, a division of National Distillers that considers itself the largest producer and seller of premium table wines in the United States. With fewer products and somewhat less regulation, though, Almaden found the conversion less difficult.

"Generally," says David Barasch, Vice President and Controller for Almaden, "we had a pretty easy conversion."

Almaden has completed its changeover to metric sizes, with the exception of brandy that is bottled for Almaden by National Distillers. The last conversion was of large "soft-pack" containers, plastic bags that hold 10 liters or 18 liters for use by institutions—primarily restaurants. These replaced the 3-gallon and 4.9-gallon sizes sold previously. Slightly smaller sizes were selected to encourage increased use by restaurants and other quantity buyers.

The wine industry particularly wanted to change to the metric system to assure that sizes were standardized. Because there were 23-, 24-, and 25-ounce fifths of wine being imported, consumers who believed they were getting a full 25.6-ounce fifth of a gallon were being shortchanged.

To prepare for the introduction of the first metric sizes, Barasch says Almaden went from selling a half-gallon of wine to selling a magnum (two-fifths of a gallon) first. The new U.S. size required a new mold for Almaden's specially designed bottles, but Barasch says the advantage was "when we went from the magnum to the 1.5 liter, the glass manufacturers only had to make a capacity adjustment to reduce the 52-ounce-size to 50.7 ounces."

Similarly, Barasch notes, "The 750-milliliter replacement for the fifth required no new bottle, just a fill-point adjustment, and therefore no new molds."

Almaden doesn't manufacture its own glass bottles, nor do most American wineries.

"New molds for the magnum and for the new 3- and 4-liter sizes cost $30,000 to $40,000 each. We don't see the cost directly; but the price of the glass bottles we buy went up when we shifted, with the costs probably amortized over a year or so," Barasch says.

"We also spent about $50,000 to modify four of our six bottling lines, and we had to make a big investment in new pallets—about 50,000 of them at $10 to $15 each." The new pallets had to be larger to accommodate the outer cases for the 1.5-liter bottle size. "Some of these would have been needed anyway because of growth, but most were simply due to the change in bottle size," Barasch notes.

Rapid Growth, Modest Price Increases

The past several years have been a time of rapid growth in the wine industry.

"Our annual revenues last year were $118 million," says Barasch. "Over the last 5 years our sales of wine increased in volume by approximately 70 percent—somewhat more than the industry, but there has been a boom elsewhere, too."

Prices have also gone up in the industry during the conversion period.

"We were in a period of rapid cost increases, with two or three increases from the glass companies every year from about 1974 on," Barasch notes. "But our own price increases were very small. Up until later 1978, we averaged approximately a 2 or 3 percent increase in prices each year from 1974 to 1979."

"Increased demand brought high grape prices in 1978, and we increased prices approximately 4 per-

cent. That's about the highest single increase I can recall. The metrication effort was not a large part of our costs."

Gallons: Not Gone and Not Forgotten

Since wine is aged in barrels, and most domestic wines spend only approximately 2 years in the bottle, there will not be many non-standard bottles around on retailers' shelves in the future.

However, there are many remnants of the use of customary measurement in the wine business. The U.S. Government still requires Almaden to make its reports in customary units.

"The wine tax and other reporting requirements," Barasch explains, "are still based on gallons, not liters, so our mandatory semi-annual inventories for the Bureau of Alcohol, Tobacco, and Firearms have to be converted from metric to customary units."

The corporation's annual report still talks of gallonage, too, as do tour guides showing visitors the winery.

Since Almaden has no internal publication, management provided Almaden's 750 full-time, year-around employees with a lecture on metric.

"We didn't find it any problem at all within the company to make the adjustment," Barasch says, "possibly because we were the only people in the worldwide market that weren't on metric. If we wanted to be a factor in the world market, we felt that it would be necessary to change. The 750-milliliter is the major world size, now it should firm up."

Adrian Cozzi, Almaden's Eastern Regional Manager, sums up the 4-year conversion: "In the beginning, it was a pain in the neck; but the difference in sizes before was a real problem. Consumers have been quick to pick up the new sizes and, in the end, it is a lot easier this way."


Levi Strauss & Co.

Levi's: *Dual Labelling for Boys' Jeans*

In April 1974, Levi Strauss & Co. led American apparel manufacturers by taking the first step toward adoption of the metric system in the United States. Company executives believed the U.S. would undergo "inevitable conversion" to the metric system, so it began labeling boy's corduroy jeans—25,000 pairs each week—with both customary and metric measurement.

Since that time, Levi Strauss has expanded its program of dual labeling to include all boys' jeans. But the company has made no other changes toward the metric system, and it plans none for the foreseeable future.

Levi Strauss, founded in 1850, has grown rapidly since it became publicly owned in 1971. With total sales reaching $1.7 billion by 1978, the company is the world's largest manufacturer of clothing. More than one-third of the company's revenues are from outside the United States, and growth in sales has been substantially greater in foreign markets than in the U.S.

With a worldwide market for Levi's products, including its blue denim jeans and clothing sold under such labels as David Hunter ® and Panatela ®, the San Francisco firm would seem to be a likely candidate to lead the move to metric by the U.S. apparel industry. But despite the company's wide-ranging international operations and an estimated 76,000 retail outlets that buy clothes from Levi Strauss, the firm has not sought to standardize products worldwide. While the company does set quality control and other requirements for the manufacture and sale of its brand-name clothing, foreign operations are conducted with a high degree of independence.

According to Mary Anne Easley of Levi Strauss' corporate communications department, the firm in each country where Levi does significant business has an independent styling staff and pattern makers. Supplies are purchased locally as well. Since Levi Strauss exports very little from the United States, compatibility here with the measurement systems used in other countries is of little importance to the company.

Nor does the firm import manufactured clothes in substantial quantities. Easley says that Levi Strauss may do additional sourcing from overseas, but even so, the U.S. divisions would specify the patterns and measurements to be used. Using customary measurement would have no substantial impact on the cost of the goods. U.S. manufacturing will continue to provide the vast majority of the apparel sold by Levi Strauss in the United States.

Since the lack of significant import/export business and the absence of worldwide uniformity in design and manufacture remove the usual incentives for using a common measurement system everywhere, a move to the metric system would have little benefit for worldwide operations. Why, then, did Levi Strauss & Co. take the first step in this direction?

According to Easley, the 1974 shift to dual measurement was stimulated by the increased use of the metric system in the schools and elsewhere in American society. The Boyswear Division was selected to test the new labels because company management believed that children were more likely to be familiar with the metric measurements and more likely to benefit from the additional information.

Easley said the new labels were well received. "Consumer and dealer response was entirely favorable," based on an informal telephone survey of retailers around the country. In some cases the company was congratulated for taking the step toward providing metric information. No one objected to the dual labels, which continued to give waist and inseam measurements with the customary units shown in boldface type.

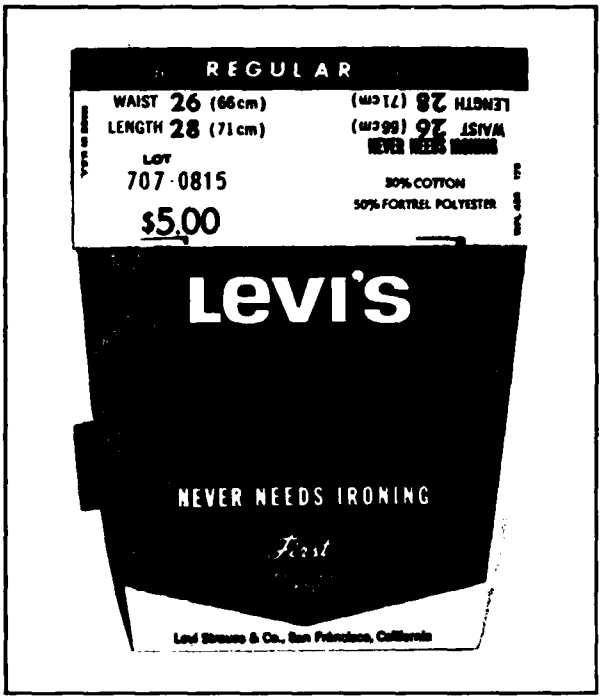
The action was taken in part because Congressional action leading to metrication was expected to come shortly, and because the American Apparel Manufacturers Association was making a thorough study of the issues surrounding metrication.

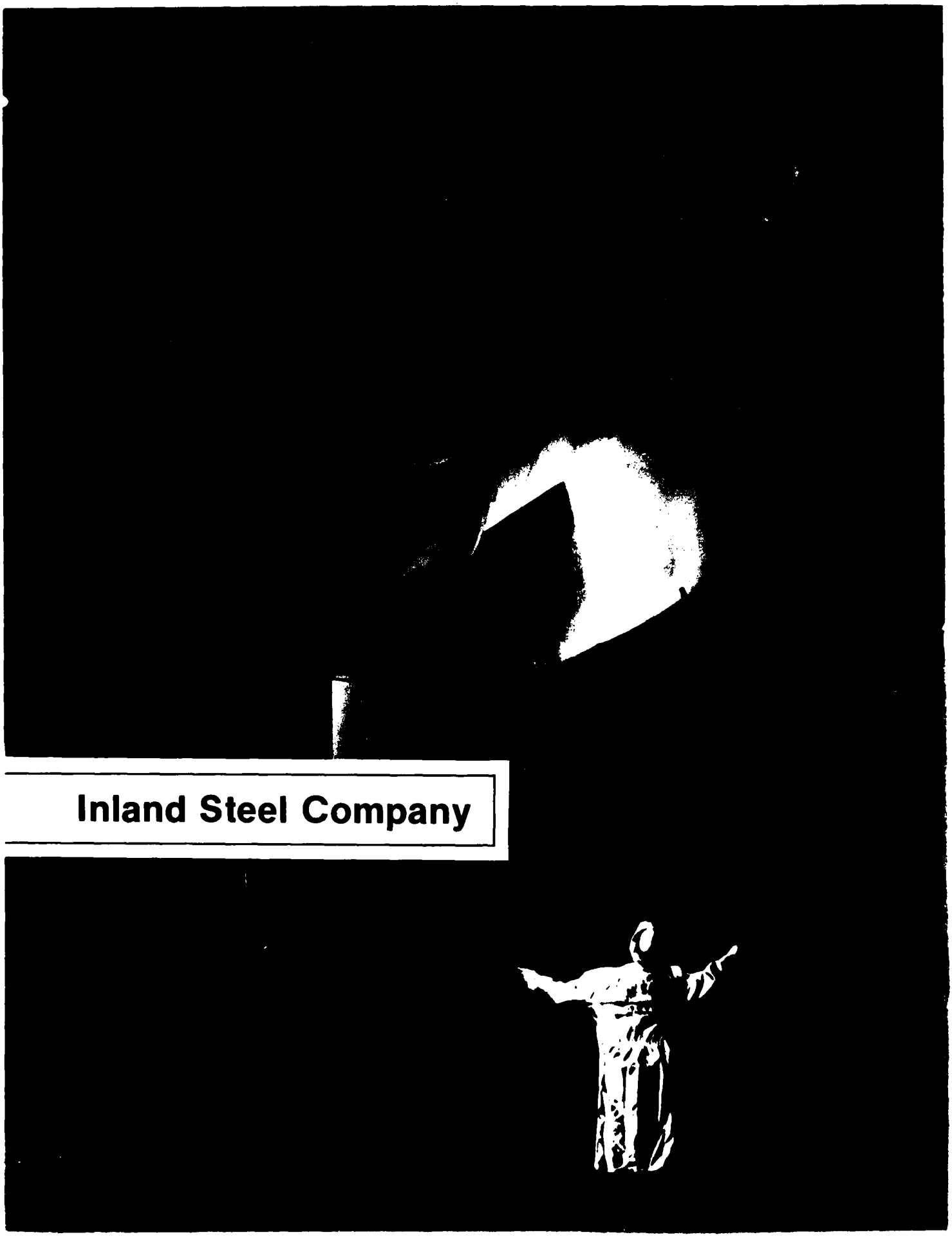
Following the successful test in 1974, Levi Strauss & Co. continued to use dual labeling for its boys' jeans. It did not, however, expand the practice to its lines of adult clothing. "We modified all the size tags on every pair of pants for boys from size 8 (for 7-year-old children) up through

30-inch x 36-inch, and that's where it ends," says Easley.

"We could implement a further change to metric labeling," Easley says, "but the advantage is unclear." The 1974 news release announcing the new dual metric labels predicted, "If dual sizing receives a positive reception by the trade and the public, the company will go ahead with dual tagging more and more garments." To this end, Levi Strauss & Co. has appointed a member of their corporate policy and planning staff to coordinate any further effort toward metrication.

Should the company go beyond dual labeling to strictly metric sizes, says Easley, customer resistance might be a more serious problem—even if the move were limited to boys' wear after 5 years of dual labeling. "A lot of our boys' pants are sold to mothers," comments Easley, "and I think most mothers would find the change very confusing. I know I would."





Inland Steel Company

Inland Steel Company: *Growing Demand for Metric Steel in the U.S.*

The Inland Steelmaker, published by the sixth largest steel producer in the United States, carried its first story on metrication in the fall of 1973, when Inland Steel erected a road sign at its main plant in East Chicago, Indiana.

The sign, which gave the speed limit in both kilometers and miles per hour, was gone by 1979. The metrication program at Inland, however, was firmly entrenched—largely in response to customers like General Motors and Caterpillar Tractor, who began specifying metric sizes for steel in the mid-1970's.

Inland, with sales of $3.2 billion in 1978, has been called the "class of the steel industry" by a major investment advisory service. Founded in 1893, the firm has developed its own sources of raw materials and has its huge steel producing plant located on the southern shore of Lake Michigan, in the middle of the nation's largest steel consuming region. About one third of the company's steel production is used by the transportation industry.

Dr. Harold Taylor, Senior Advisor for Inland Steel's Research Department, is in charge of the company's metrication effort, which was formally organized in 1974. Taylor says the program is "a continuing low-priority effort. We believe in changing to metric as we can benefit from the change, hopefully at no cost and in response to our customers' needs and in coordination with our suppliers."

Caterpillar Tractor stimulated the early move to metric at Inland by notifying the company, which sells 96 percent of its production in a 20-state area in the mid-United States, that it was planning to change to the use of specific metric sizes for its manufacturing. Discussions with Caterpillar and other large customers persuaded the firm to develop a computerized order-entry system that could handle the metric orders that were expected to come with increasing frequency during the late 1970's.

Since that time, Inland has introduced the new metric ordering system successfully. It has also begun the process of incorporating metric in instrumentation for a major plant expansion and has published a catalog of steel products available in metric sizes. Product brochures also give both customary and metric measurements.

Metric Steel Sales

Approximately 13 percent of Inland's steel sales by 1978 were in response to metric orders, of which the majority came from some of Inland's largest customers.

Statistics from a number of steel companies compiled by the American Iron and Steel Institute indicate that approximately 14 percent of cold rolled sheet steel order quantity is specified in metric thicknesses and widths. Altogether, approximately 4.9 percent of the total shipments of the reporting companies result from orders for metric sizes.

In changing to metric, many steel users are incorporating into their designs the preferred metric thicknesses, diameters, widths, etc. established by the American National Standards Institute. These sizes are published as ANSI B32.3-1977 "Preferred Metric Sizes for Flat Metal Products" and B32.4-1977 "Preferred Metric Sizes for Round, Square, and Hexagonal Metal Products." As stated in the standards documents, "the simplified preferred sizes given in this standard should facilitate interchangeability of metals in design, reduce inventories, and increase the availability of warehouse stocks of those sizes commonly used for general purpose applications."

Purchases of metric steel continue to grow, and the reduced number of sizes provides an advantage by reducing customers' inventories. Until the nation moves entirely to metric measurement, though, steel companies will be producing an increased number of sizes, and steel service centers will have to carry more sizes in inventory or risk being unable to supply both customers who require metric sizes and those who order customary sizes.

A number of major manufacturers have led the move to metric steel. In addition to Caterpillar, General Motors has switched, with each of its divisions following separate schedules. Fisher Body, the largest buyer of sheet steel in the United

States, began buying metric sheet in October 1975 for use in the 1976 Chevette. Dr. Taylor reports that by 1977, GM's purchases of metric steel were substantial. Taylor also noted that one of the major farm equipment companies began ordering steel from Inland in metric sizes in 1979.

Inland's computerized order-entry system was an important first step toward increased sales of metric steel. James Olson, Supervising Consultant for Computer Systems at Inland, says that about 6 man-years of effort were required to reprogram the company computers and to modify other documentation for customers. The new system went into effect in July 1976.

To be certain that no one will send out reports with different converted data for the same steel (data in metric and corresponding customary units), there is just one computer program for converting which is used in all reporting systems. The program will accept metric or customary units and convert accordingly.

Although a substantial number of orders now arrive with metric data, Olson says, "All of our mills still operate in customary units, and we did not change our manufacturing process or our instrumentation. We limited the change to providing all of the paperwork—order acknowledgement, bills, test reports—in dual measurement for those who specified metric sizes."

To assure that the customer receives exactly what he orders, the instructions to the mills are made to the precise customary equivalent of the metric size requested.

Dr. Taylor believes that Inland's customers will determine the extent to which both metric and non-metric steel is sold. "When a preponderance of our orders are in metric," he says, "we will eliminate the dual ordering system."

Members of Inland's Metrication Coordinating Committee are not optimistic that customers will shift to strictly metric measurement in the near future. Most of them agree with Olson's comment: "Some of our customers will be ordering in customary units for another 50 years."

Metric Instrumentation at Inland's New Plant

The company's conviction that metric measurement will become increasingly important in the U.S. is reflected in the huge northward expansion of Inland's production facilities. A new blast furnace, coke battery, and boiler house are being built at the Indiana Harbor Works—already the nation's largest steel producing plant. The new facilities are being constructed to U.S. customary measurements, but the instruments for controlling production all read in "SI" metric units.

Taylor says that the huge expansion program is Inland's biggest capital project to date. The use of metric for process measurements in a project of this magnitude is a first among the processing industries of the United States.

Since extensive training was planned for employees moving into the new facilities, the situation offered an excellent opportunity to begin the change to metric measurement with little or no additional cost.

No problems in training operators to use metric instrumentation were anticipated since "early in the game the operators reported that little attention is paid to units of measure." Instead, the dial readings or just the positions of needles are of major importance.

Johnny Watts, a preheat operator for the coal production facility, says he had about 3 weeks—on and off—of metric training. He confirms the view: "The only thing we worry about is where the gauge needle sits."

Watts says he prefers the new system. "It's much more simple. I like it better—both the new equipment and the measurements."

After spending his day watching temperature dials that read only in Celsius, Watts says that his new knowledge hasn't really affected his life off the job. Asked if he understands Celsius temperatures when they are used on the television weather report, he says, "To tell the truth, I never noticed it."

In addition to metric instrumentation, the new facility uses metric equipment and designs from Japan and Germany. The Japanese have an agreement to supply expert assistance in blast furnace technology. The stoves for the furnace were designed in Germany.

To capture power from the top-gas pressure produced by the giant blast furnace, Inland is installing an expansion turbine supplied by Japan's Kawasaki Heavy Industries. The equipment will recover about 12 megawatts of available power from the process when producing 6400 Mg/day of iron, substantially reducing energy use and cutting power purchased from the local utility. This technology was originally developed and installed in France by Sofrair, and expansion turbines have also been installed in the USSR and Japan (all

metric countries). Inland's installation will be the first in the United States.

"The new metric equipment will require a complete set of metric tools, but we think our mechanics will find it pretty easy to handle," reports Douglas Hepp, Foreman of the new #5 Boiler House.

Hepp says that the mechanics will have another use for metric tools, one that wasn't planned. Two new Turbodyne pumps used to supply water to the boiler turned out to be metric, despite the fact that they were supplied by an American manufacturer, Studebaker-Worthington.

"We really didn't know they were metric until they arrived," Hepp says. Where the pumps connected to other equipment, they met specifications prepared in customary units. Because the pumps were metric internally, Inland mechanics had to order metric wrenches to be able to work on them. Operators for the new boiler received considerable training despite their long years in Inland's other boiler operations.

"We had an 11-week training program and tests for all of our operators to teach them how to operate the new equipment. From the beginning, all of the instructions were in metric. Our youngest guy started with Inland in 1964. Our top operators have more than 30 years with the company." Hepp says.

When the new boiler joined four others in supplying power to the Indiana Harbor Works, another difficulty developed: "Only one of the five boiler houses is metric, so we have our #5 power house operators convert the numbers reported to the load dispatchers. The instructions coming back from the dispatchers, to add or cut load, are in customary units and our operators have to make the conversion back to metric," Hepp says.

When a new central control system is installed to increase the company's efficiency in using energy, an automatic system will take over the reporting function. At present, a control computer is used to convert the metric data to customary units for the dispatchers, and to convert resulting instructions back to metric for the operators.

Harold Skelley, Inland's Chief Engineer, says, "We've done a lot more in metric, including laying out a plate mill using metric dimensioning." The next production facility will probably use metric, and a new policy was issued on June 28, 1979, with the stated intent "that all instrumentation and controls at the Indiana Harbor Works have only SI unit readouts by January 1, 1990." This policy establishes an approach for phasing in SI units on existing as well as new facilities.

Dr. Taylor says that the combination of cost-consciousness and careful planning has kept costs for metrication very low, and has assured that expenditures were made where they would be beneficial to the company and its customers. The largest costs so far have been for computer systems primarily for the order entry system.

Although the company magazine has had regular stories about metrication, few of Inland's 36,000 employees have had first-hand experience with the conversion so far.

Industry Progress Toward Metrication

Taylor, who chairs the American Iron and Steel Institute (AISI) Metrication Planning Committee, feels that the steel industry will continue to make slow but steady progress toward metrication.

At first, steel companies were hesitant to discuss a common plan to convert to the metric system nationally. Taylor says that one major company delayed joining a metric study committee of the AISI because the company's lawyers felt that discussions might be misinterpreted under the law.

Metrication involves all aspects of any business, from engineering standards to prices. Therefore, it can be a danger area. Despite the early concerns, however, the steel industry has managed to put together a comprehensive metrication effort with emphasis on planning and training.

"AISI has had a strong program compared to many other suppliers of basic materials," Taylor notes.

Metric Conversion Act Highlights

Section 3 and 6 state the primary purposes of the Act and duties of the Board. Section 6 is summarized. A complete copy of the Act can be obtained by contacting the U.S. Metric Board.

"Sec. 3. It is therefore declared that the policy of the United States shall be to coordinate and plan the increasing use of the metric system in the United States and to establish a United States Metric Board to coordinate the voluntary conversion to the metric system."

"Sec. 6. It shall be the function of the Board to devise and carry out a broad program of planning, coordination, and public education, consistent with other national policy and interests, with the aim of implementing the policy set forth in this Act. In carrying out this program, the Board shall—

- Consult with and take into account the interests, views, and conversion costs of United States commerce and industry . . .
- Provide for appropriate procedures whereby various groups . . . may formulate . . . specific programs for coordinating conversion . . .
- Publicize proposed programs . . .
- Encourage . . . standardization organizations to develop or revise . . . engineering standards on a metric measurement basis . . .
- Assist the public through information and education programs, to become familiar with the meaning and applicability of metric terms and measures . . .
- Collect, analyze, and publish the information about the extent of usage of metric measurements; evaluate the costs and benefits . . . and make efforts to minimize any adverse effects resulting from increasing usage . . .
- Conduct research . . . and recommend to the Congress and to the President such action as . . . appropriate to deal with any unresolved problems . . .
- Submit annually to the Congress and to the President a report on its activities . . . [which] may include recommendations [for] legislation . . . needed to implement programs of conversion . . .
- Submit to the Congress and to the President . . . a report on the need to provide an effective structural mechanism for converting customary units to metric units in statutes, regulations, and other laws at all levels of government. . . ."

PUBLICATIONS AVAILABLE FROM THE U.S. METRIC BOARD

U.S. Metric Board Annual Report; award-winning annual report to the President and Congress on the Board's first full year of activities.

U.S. Metric Board—An Introduction; pamphlet describing USMB goals and policies and listing typical questions and answers about the metric system.

U.S. Metric Board: Its Role in Voluntary Conversion: reprint of an address by Dr. Louis F. Polk, USMB Chairman, to the Fifth Annual Conference of the American National Metric Council.

Metric Speakers Directory; a state-by-state listing of qualified individuals who are available to address groups on metric topics.

Antitrust: A Handbook for Metric Planning and Conversion; a layman's guide for avoiding antitrust problems in metric planning and conversion. Contains a clearly written list of 18 do's and dont's and an overview of relevant antitrust laws.

Providing a Metric Option; a report to the Congress on the need for a structural mechanism for converting customary units to metric units in statutes, regulations, and other laws at all levels of government.

The Conversion of Retail Fuel Pump Computers to Sale by the Liter; a staff report including point-by-point analysis of witnesses' testimony at the May 1979 hearings.

Selecting a Gasoline Pump Computer; a guide to help petroleum marketers decide the best way to adjust computers to permit full pricing.

What About Metric?; pamphlet containing general information about the use of the metric system.

America and the Metric System: A capsule history; an information sheet on the history of the metric system in America.

U.S. Metric Board Backgrounder: Information sheet on the U.S. Metric Board.

Conversion Factors: One-page table of conversion charts.

All You Will Need to Know About Metrics: Information sheet with basic information about the metric system.

To obtain copies of these materials write: Office of Public Awareness and Education, U.S. Metric Board, 1815 No. Lynn St., Arlington, Va. 22209. NOTE: the supply of some materials is limited.