Metrication

Article slightly abbreviated for lack of space

Back in 1795 after the Revolutionary War, the United States considered breaking away from the English system of measurements. We were breaking away from England in many other respects. The French, our allies, were promoting a radical new system based on multiples of ten. We had already adopted a decimal coinage system, so there was strong support for the new decimal measurements referred to as the metric system.

Congress failed to act, however; and so we have drifted along using the comparatively complicated English system. How much simpler it would have been if the right decision had been made then. Metric system legislation was introduced in Congress in 1866, 1896, 1901, and many times since. Bills are now being introduced every year, and we can expect passage soon.

Actually, there is no single metric system. France originated the system in the late 1700's, but it has been modified in Germany, in Italy, in Japan, and in other countries to the point that each country has its own metric system–similar to the others but different enough to create problems.

We in this country are working with the metric countries to establish a uniform metric system called the Systeme International, or SI for short. This uniform system is basically metric, it is the one we expect to adopt, and we shall refer to it here simply as the metric system.

Probably not one of us can talk easily in terms of meters, liters, and grams. We have heard the terms. But the metric system is still a bit strange and foreign to us. In fact, it's rather disconcerting to realize that in a few years our Miss America with her "perfect 36" will be gone forever. She will be Miss America with a "perfect 91." But before your imagination starts taking off on that one, let me hasten to add that by that time we will be so metric-oriented that we will think of a "perfect 91" as wonderful, and she will not have changed one centimeter!

Let's review the metric system briefly to see how the metric system will affect each of us in our daily lives.

Figure 1 shows some of the basic units of measurement, with comparable metric and English system designations.

Figure 1. Basic Units

UNIT	ENGLISH	METRIC
Length	Inch	Meter
Weight	Ounce	Gram
Temperature	F.	Celsius
Liquid	Quart	Liter
Pressure	PSI	Pascal

Figure 2 shows some of the conversion factors between English and metric linear measurements. This illustrates the difficult part of changing to the metric system. The conversion factors are variable because of the different multiples between inches and feet, feet and yards, etc., in our English system. The difficulty, therefore, is generated by the characteristics of our English system rather than the metric multiples.

Figure 2. Linear Relationships

ENGLISH	METRIC	CONV. FACTOR*
Inch	Millimeter	25.4
Foot	Centimeter	30.5
Yard	Meter	0.914
Mile	Kilometer	1.61

*English To Metric

Figure 3 shows how simple the metric system really is, with various multiples of ten being used whether measurement is lengths, weights, or volume. Some of the multiples are not in common usage but prefixes have been established and are, therefore, part of the system. In the case of the basic unit of length, which is the meter, the other multiples in common usage are the millimeter, centimeter, and kilometer. In the case of weights, with the gram as the basic unit, the milligram and kilogram are the other multiples in common usage.

Figure 3. Metric Multiples

Meter Basic Unit = 1

PREFIX	SYMBOL	UNITS (meters)
Kilo	K	1,000
Hecto	H	100
Deca	DA	10
Meter	(basic)	1
Deci	D	.1
Centi	C	.01
Milli	M	.001

How does the metric system affect our daily lives?

Assume that it's 20 years from now and a new day is dawning. The alarm rings, you bounce out of bed, and the first thing you do is check the thermometer. That's when you enter the metric world. The thermometer reads 10 degrees. That's 10 degrees Celsius. On the old Fahrenheit thermometers it would have been an invigorating 50 degrees.

Perhaps you are familiar with the Centigrade scale from your school days. This is now known as the Celsius scale. It is identical to the old Centigrade scale; it has simply been renamed to honor the scientist who originated the idea. Zero on the Celsius scale is the freezing point. 100 degrees Celsius is the boiling point of water.

After you have checked the temperature on the morning 20 years from now, you shower and shave and sit down to breakfast. Instead of taking a quart of milk from the refrigerator, you take a liter of milk–just a fraction more than a quart. If you have a bowl of cereal, the box gives the net weight in grams, not in ounces.

After you finish breakfast, you kiss your "perfect 91" good-by and hop into the car for the drive to your office. The office is no longer 10 miles away but, instead, 16 kilometers away. And you don't drive 60 miles an hour. You drive 96 kilometers an hour.

On the way you stop for gas and tell the attendant to "fill it up." He puts in 60 liters–about 16 gallons. At

(Continued next page)

today's gasoline prices, the attendant would charge you between 10 and 12 cents a liter. I have a suspicion the price may be higher by that time!

So far, except for the Celsius temperature scale, the metric terms we have used are familiar–liter, gram, kilometer. But if you ask the gas station attendant to check your tires, he won't inflate them to 30 pounds per square inch but, rather, to 200 kilopascals. The "Pascal" is a unit of pressure, and to most of us it is a new term that we will learn to use when we convert to the metric system.

In our daily life, we will use the metric system in many other ways. When we mow our lawns, we will set the mower for 5 centimeters, not 2 inches. When we buy a belt, it will be so many centimeters long. When we order lumber, we won't order 2 by 4's. And when we step on the bathroom scale, it won't read 200 pounds. It will read 91 kilograms.

We and our parents and grandparents have been happy with our Fahrenheit thermometers, our 12-inch rulers, and our quarts of milk. Why should we change to the metric system?

One, it is a better system than our English system. It is simpler, more coherent, more logical, and easier to work with.

Two, we have no choice. *The entire world is going metric.* Even England, where our system of weights and measures originated, has adopted the metric system and, over a period of 12 years, is phasing out the old system of inches, feet, and yards; ounces, pounds, and tons; pints, quarts, and gallons. Mexico is metric. Canada has committed itself to going metric.

We are almost alone in the world in sticking to the English system. There are only 11 other countries that haven't taken steps to go metric, Trinidad, Barbados, Jamaica, Guyana, Gambia, Sierra Leone, Southern Yemen, Muscat, and Oman and Burma. In addition to these, there are two small island countries in the Pacific, Tonga and Nauru, which have still not committed themselves to the metric system.

This is a ridiculous situation for the United States. We are in step with 11 countries which have a combined population less than the state of Texas and a combined area just slightly larger than the state of Texas. We are out of step with the rest of the world.

Obviously, the United States has to go metric. Is it a big step? Of course it is. But it isn't as big as we might think.

There will be a period of transition. You and I have a period of years in which to learn to use the metric system.

Secondly, that transition period has already begun.

In our daily life, we are accustomed to buying 8 mm, 16 mm and 35 mm film for our cameras. Your druggist measures your prescription in grams and milligrams. Many of our packages today are expressed in weight by both ounces and grams.

Some of us may be counting calories. Others perhaps should be. A calorie is the amount of heat required to increase the temperature of one gram of water one degree Celsius, and is therefore a metric unit. So keep on counting calories. They won't change.

In our business life, that transition period has begun also. The real effort and the actual dollar costs of converting to the metric system fall most heavily on business and industry, yet the advantages of getting in step with the rest of the world are so great that business and industry are converting rapidly–already!

About 30 percent of Ford Motor Co.'s production worldwide is metric. Ford has opened a new plant at Lima, Ohio, and now is building a completely metric engine there for the Mustang II. The engines being used in the Ford Pinto, Plymouth Cricket, Dodge Colt, and Chevy LUV are already metric.

At General Motors, all new development now will be metric from the start.

John Deere is producing metrically dimensioned tractor engines here and in Europe.

IBM initiated a 10-year conversion program in 1971.

At its Hough plant at Libertyville, Illinois, International Harvester is designing and manufacturing all new products in metric measurement units.

Manufacturers of small engines will follow suit. You can expect that new designs soon will be metric.

These actions are being taken even though there has been no legislation yet. Perhaps it's better that way. With the present active participation of the United States in refining metric standards, and a gradual changeover by manufacturers at their convenience, perhaps the total cost and disruption can be minimized.

Total conversion to the metric system in the United States, according to one estimate, would cost 100 billion dollars. The cost to small engine central and service distributors and dealers will be an infinitesimal part of that.

(Continued next page)

The real burden falls on manufacturers.

An estimated 10 percent of the total 100 billion dollar cost will be in what is called "soft" conversion–simply expressing measurements of our present products in metric equivalents–on drawings, on literature, on labels, on packaging, in books, in records. We would also change road signs, gasoline pump meters, and innumerable other familiar items now bearing nonmetric language.

The remaining 90 percent of the cost of going metric is in what is called "hard" conversion. Hard conversion means complete redesigning of products to metric measurements. That means redesigning every component in a Kohler engine. Every component in conveyor systems and lift trucks. Every gauge. Every measuring device.

When the heating system in a Kohler factory is replaced, when the wiring is replaced, when the building itself is replaced, all components will be metric, from bricks and 2 by 4's to boiler pipes and light fixtures.

Convert all industry and all products to the metric system, and you can understand why the total cost has been estimated at 100 billion dollars. Keep in mind, however, that the conversion will be gradual and that the cost will be spread over 10, 20, or more years. Keep in mind, too, that if we don't convert to the metric system, we could lose many times 100 billion dollars in international trade in the next century; and that would affect the standard of living for all of us.

School systems are already starting to teach the metric system so that young people will be well prepared for the transition period.

The conversion to metric will increase the inventory of hardware items somewhat for small engine distributors and dealers, because they will have to carry replacement nuts and screws for today's nonmetric engines at the same time that they are "phasing in" metric parts. Other parts are unique to a particular engine anyway, unless you are dealing with a family of engines with some interchangeability of parts. So I would conclude that the effect on inventory cost would be minimal.

Small engine distributors and dealers will have to double up on some tools during the transition period. They will need the nonmetric tools they have now, but they will need metric tools also.

Many of our present tools will need no conversion. Others such as socket wrenches, open end wrenches, torque wrenches, pressure gauges, and micrometers must be sized or calibrated to the metric scale. The cost of equipping a dealership with metric tools is moderate.

Will we have to train dealers in the metric system? Probably not. For one thing, many of them already work with metric engines–snowmobile engines, motorcycle engines, diesel engines–and I suspect they worked into it without any special training in the metric system.

Also, dealers order replacement parts by part number, whether the parts are metric or non-metric.

Thirdly, at the risk of repetition, the transition will be gradual and dealers will learn to think metric and talk metric almost without realizing it.

Actually, this discussion can be summarized in a few words:

The United States is going metric. Legislation is imminent. Companies are already changing.

Small engine manufacturers are going metric. New designs are apt to be metric, while production continues for a while on non-metric models. Or we could say it this way–as older models are dropped from the product line, new products will be metric.

Small engine distributors and dealers are going metric. And they will do so at minimum cost, with minimum effort, and so gradually that they will be part of the metric world before they know it.

Along the way, we will forget a few things–like the "perfect 36." Or that time-honored saying, "An ounce of prevention is worth a pound of cure." And Texans will have to give up, or resize, the 10-gallon hat.