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## Rochester and the Metric System

| 8



Also in this issue:  
**2008 Explorer Post Program**

| 48

Photo courtesy of Jim Alexander, November 2007

# Rochester and the Metric System

by Howard Ressel, PE

*The metric system is well known to most Rochester Engineer readers as it is the language of business and industry world wide. Just how did we get here and how come the U.S. is lagging behind. Are we really that far behind? On the surface, maybe so, but with so much of Rochester's economy based on business, industry, science and research perhaps we are further along than most people think. Is Rochester a hotbed of metric activity?*

## History of the Metric System

Like anything historic, time clouds memories and documentation is not always clear. We may never know the exact origins of the metric system. One thing is clear though, the development of the metric system has had a significant impact on world unification and communications. Without a unified clear and universally accepted measurement system, trade amongst all nations would be difficult at best, impossible at worst.

### Early Development

Most historians agree that Gabriel Mouton, the vicar of St. Paul's Church in Lyons, France, is the "founding father" of the metric system. He proposed a decimal system of measurement in 1670. Mouton based it on the length of one minute of arc of a great circle of the Earth (now called a nautical mile, 1852 meters). He also proposed the swing-length of a pendulum with a frequency of one beat per second as the unit of length (about 25 cm). It was obvious to scientists of the day that a clear, easy to reproduce, measurement system was needed.

In 1790, in the midst of the French Revolution, the National Assembly of France requested the French Academy of Sciences to "deduce an invariable standard for all the measures and all the weights." The Commission appointed by the Academy created a system that was, at once, simple and scientific. Although it took some years and much political wrestling, Napoleon's rule notwithstanding, the metric system gained favor. Adoption by other nations occurred steadily after France made its use compulsory in 1840.

### Metric Comes to America

The system found favor in the United States. By an Act of Congress in 1866, it became "lawful throughout the United States

## Status of metric usage in the United States (a summary)

Many people do not realize the extent of metric usage in the United States. Here are some facts about metric in the United States:

- Metric is now required along with inch-pound units on most consumer products.
- About 50% of measures in the U.S. are metric. (Many of those measures are used in the fields of science, engineering, manufacturing, and international trade.)
- All inch-pound measures are defined and calibrated to the SI metric system (Inch-pound units are currently based, by the U.S. government, on the metric system.)
- Metric is used predominantly in the rest of the world, with the U.S. being the only major holdout.
- The Metric Conversion Act (<http://lamar.colostate.edu/~hillger/laws/metric-conv.html>), first passed in 1975 and amended in 1988, is still in effect in the U.S.

of America to employ the weights and measures of the metric system in all contracts, dealings or court proceedings. Actual conversion has been considerably slower.

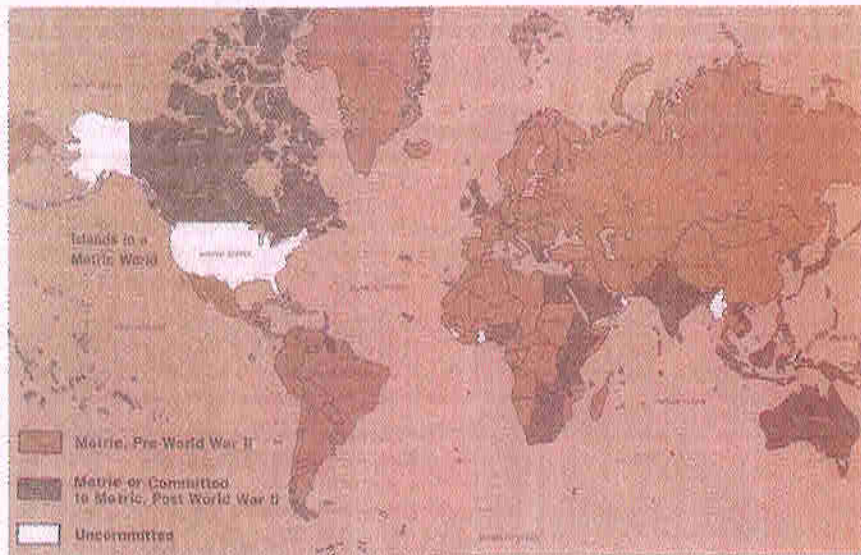
Through the years since 1875 many international agreements have been penned to define and refine the metric system. The original **Convention of the Metre** (<http://lamar.colostate.edu/~hillger/laws/metric-convention.html>), set up well defined metric standards for length and mass and established permanent mechanisms to recommend and adopt further refinements in the metric system. This agreement, commonly called the Treaty of the Meter in the United States, was signed by 17 countries, including the United States. Since 1893, the internationally adopted metric standards have served as the fundamental measurement standards of the United States. Our non-metric units have been defined in terms of these metric standards ever since.

In 1960, the General Conference on Weights and Measures, the diplomatic organization made up of the signatory nations to the Convention of the Metre, adopted an extensive revision and simplification of the system. Seven units — the meter (for length); the kilogram (for mass); the

second (for time); the ampere (for electric current); the kelvin (for thermodynamic temperature); the mole (for amount of substance); and the candela (for luminous intensity) — were established as the base units for the system. The name *Système International d'Unités* (International System of Units), with the international abbreviation SI, was adopted for this modern metric system.

There was a strong movement toward the use of the metric system in the U.S. during the mid 1970's. On December 23, 1975, President Gerald R. Ford signed the Metric Conversion Act of 1975 which finally gave official federal sanction for the

end of that year. Because the 1988 amendments had some loopholes, some government agencies lagged far behind in their conversion efforts. It was during this time that the U.S. Department of Transportation and the Federal Highway Administration began to mandate conversion of all State Highway Agencies (SHAs). Resistance varied and some state's efforts were very successful (New York and California), but others lagged far behind. The construction industry lobbied hard and eventually Congress removed the mandate for conversion. Failure was most likely related to the efforts to convert only a small part of the construction industry. While an important component, the transportation industry is only



***The world in 1971, from the NBS metric study***

U.S. to convert to using the metric system. However, the original 10-year deadline (for conversion) was somehow dropped from the final version of the bill.

In accordance with the 1988 amendments to the Metric Conversion Act of 1975 that directed Federal agencies to convert to the metric system, President George H. W. Bush, in 1991, signed an Executive Order which notified government agencies that they must have their metric conversion plans completed and approved by the

one small portion of the billions of dollars that are spent on construction each year. As of this writing nearly every SHA, including New York and California, have either completed or announced plans to revert to English customary units of measurements.

It's quite clear that the U.S. efforts to convert to the metric system have been filled with false starts, mistakes, and sometimes major retreats. Each progression though brings more awareness and more acceptance of the inevitable.

Is your company a Rochester Metric Company? Let us know. Contact Howard Ressel at the following email. We hope to publish a list in a future edition of the *Rochester Engineer*.

[hressel@frontiernet.net](mailto:hressel@frontiernet.net)

***Metrication,***

***U.S. Industry and Rochester***

Although conversion lost the favor of the general U.S. population, the conversion to metric by industry and the benefits to companies dealing on the expanding world market was not lost. Many companies, indeed entire industries converted to metric. GM announced its intention to convert in 1973 and the U.S. auto industry quickly followed. Many products are produced or sold in metric units by U.S. companies worldwide. Rochester companies have been at the forefront of the metric industrial revolution. After 1975, all new products manufactured by Xerox in the U.S. were made to hard metric specifications; Kodak also joined the bandwagon and began its conversion process in 1998 (to learn more about the Xerox and Kodak metric stories, go to <http://lamar.colostate.edu/~hillger/pays-off.html>).

As world trade continues to grow, further pressure is on U.S. labeling and packaging laws to allow metric only labeling. Have you looked at products in the grocery store lately? More and more are packaged in hard metric units. Wine and liquor have been metric for decades and most local liquor ads now show metric bottle sizes only. Proctor and Gamble has scores of products in hard metric units, and a "two-liter bottle" is its now part of our vernacular. Only two States have not changed their fair packaging laws to allow metric only labeling (New York being one of them), but movement toward changes in these states is on-going and it is hoped that legislation will soon be passed in New York.

*continued on page 12...*

### *U.S. Metric Standards*

A U.S. primary metric standard was approved for industry in 1997 with the merging of the two metric standards developed by the Institute of Electrical and Electronics Engineers (IEEE) and the American Society for Testing and Materials (ASTM). Membership in these two groups included USMA members who worked on this project. They continue to work in the committees charged with updating and revising this U.S. industry national metric standard which is called the American National Standard for Use of the International System of Units (SI): The Modern Metric System (known as IEEE/ASTM SI 10 2002). The standard is being reviewed as of this writing.

### *The USMA*

The U.S. Metric Association (USMA), which was originally called the American Metric Association, was organized on December 27, 1916 at Columbia University, New York. A group of businessmen, educators, and consumers met at that time, holding its meeting as a separate portion of the 1916 annual conference of the American Association for the Advancement of Science (AAAS). USMA became an affiliate of AAAS and has continued this affiliation with AAAS to this day.

The main speaker at the association's first meeting was Madam Montessori, the famed Italian originator of the Montessori teaching system which is still used throughout many countries. George F. Kunz, of Tiffanys jewelers was USMA's first president. The

### **National Metric Week**

During this week (the week that includes October 10) the National Council of Teachers of Mathematics, celebrates and promotes the metric system in the US. For more information go to <http://www.nctm.org/metric-week.aspx>

Association's original offices were in New York City. In May, 1973, USMA became incorporated in Colorado as a non-profit organization. Its Articles of Incorporation state that USMA is incorporated for the purpose of promoting the use of the metric system of measurement as the United State's only measurement system. When various metric bills were discussed by legislators or were introduced in Congress, a number of USMA's officers and members were invited to testify during the discussions.

Over the years, USMA's officers and members have worked, as U.S. citizens, with Congressional legislators on drafting a large number of bills regarding U.S. metrication. Although not always successful, the USMA continues to work towards its goals. USMA also coordinates with the U.S. government's representative to the Committee International des Poids et Mesures (CIPM) and is involved with continuous efforts to revised and update the international metric standard called the International System of Units (SI). This international standard is published and updated or revised by the Bureau International des Poids et Mesures (BIPM).

### *The USMA's goals are to:*

- Unite the efforts of all individuals and organizations interested in promoting the metric system.
- Determine effective methods for metric conversion to facilitate world trade, education, science, and the general public welfare without undue financial hardship on the public, commerce, and industry.
- Publish information outlining advantages of early metric adoption.
- Broaden and sustain metric interest through meetings and publications.
- Encourage offering of awards and citations for outstanding

contributions in promoting metrication.

For years, USMA has helped many companies in converting their measurement systems to metric, furnishing training aids and also providing the names of metric experts who could be hired as consultants to help in the conversion.

For more information about the USMA, or yo find out how the USMA can help your business convert or to learn more about the metric system go to

[www.metric.org](http://www.metric.org).

The web site provides a large variety of metric system information and is considered the best available site devoted to the metric system. You can also join the USMA Listserver (Mailing List) for those interested in metrication to exchange ideas and to discuss any aspect of the metric transition. □

### **How can you help locally?**

Rochester's technical and scientific community is strong and our contribution to the global economy exceeds the output of many countries. With this we have a great opportunity and a responsibility to speak out for metric conversion and tell our community how important it is that this country join the rest of the world.

Can you help? Consider joining the U.S Metric Association and working with us to start a Rochester Chapter of the USMA. There are just a few of us now, but with your help USMA and Rochester area members could be a U.S. leader in our quest to convert. If you are interested please contact Howard Ressel, USMA member at 585-235-2584 or email at [hressel@frontiernet.net](mailto:hressel@frontiernet.net).

*Howard Ressel, PE (RES Member) is a Project Design Engineer, Region 4, New York State Department of Transportation.*