

Brief History of Measurement

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April - May 2021

Who is Jack Baldwin?

- Retired from GE Aviation in 2016
- Background in mechanical engineering & chemistry
- Enjoy dabbling in computers
- Enjoy teaching others

Why this topic?

Many people assume that:

- measuring tools haven't changed
- the development of measuring tools has been linear
- today's inch/degree/second have always been the same
- “a pint is a pound the world around”

Overview

Five one-hour classes:

- Class 1 – Overview
- Class 2 – Measurement of length
- Class 3 – Measurement of time
- Class 4 – Measurement of speed
- Class 5 – Going Forward

Video

What Is Metrology?

API Metrology

<https://youtu.be/Ma8OmcEO9Pk>

How Much Do We Have?

- After Rome left Britain, abandoned Roman camps became community centers with regional ruler
- Regional ruler authorized standards for weights and measures
- All good until trade increased between communities – “you’re cheating me!”
- 1016 Ethelred the Unready King of England passed statute that “hateful illegalities be earnestly shunned” throughout the realm; first among those was “false weights and measures”
- 1215 Magna Carta had devoted section to “one weight, one measure” and one measure of volume

Roll Out the Barrel....

- Ale barrel based upon corn gallon (32 gallons)
- Beer barrel based upon wine gallon (36 gallons)
- Wine barrel (36 gallons)

BUT ----

An ale barrel is 281 cubic inches

A beer barrel is 231 cubic inches

Queen Elizabeth I

- Restored the corn gallon to 268.8 cubic inches
- 281 cubic inches became the new ale gallon – also used for malt liquor
- standardized measures of capacity or volume

So by 1590 or so....

- Mouthful (about a cubic inch)
- Jigger – twice a mouthful also called handful
- Jack – twice a jigger also called jackpot
- Gill – twice the jack also called a jill or a double jack
- Cup – twice the gill
- Pint – twice the pint
- Quart – twice the pint
- Pottle – twice the quart
- Gallon – twice the pottle

Until King Charles (1600 – 1649)..

- Wanted more taxes
- Levied tax on jackpot
- Reduced the size of the jackpot
- Collection of taxes to corporations

Led to British revolution of late 1600's

International System of Units

- Scientific advancements and discoveries started coming fast and furious about 1600
- World trade began expanding about the same time
- Sharing information/data was difficult, if not impossible
- The French Revolution was driven in part by lack of standards
- For example, Newton had to choose which set of units to use in his research

International System of Units

- 1793 meter was established as $1/10,000,000$ of the distance from the equator to the north pole
- Shortly thereafter we get
 - Kilogram – unit of mass
 - Second – unit of time
 - Ampere – unit of electric current
 - Kelvin – unit of temperature
 - Candela – unit of light intensity

Today?

Unit	Cubic Inches
1 pipe	32,768
1 hogshead	16,384
1 barrel	8,192
1 bushel	2,048
1 keg	1,024
1 pail	512
1 quart	64
1 cup	16
1 gill	8
1 jack	4
1 handful/1 jigger	2
1 tablespoon	1

Going Forward

US volume measures are now based upon the cubic centimeter:

1 US gallon = 3.785.4 cc

1 US liquid pint = 473.179 cc

Except

- Most jigger glasses are 1.5 cu in or 1.25 cu in
- In the US dry pints are not the same as liquid pints (33.6 cu in vs 28.875 cu in)

Video

Metrology in Daily life

VSL National Metrology Institute

<https://youtu.be/vRnT8hIxjqk>

Questions?

Background Material

The Science of Measurement

Herbet Arthur Klein

Ancient Measurement

Roland A. Boucher

World in the Balance: The Historic Quest for an Absolute System of Measurement

Robert P. Crease

A Brief History of Measurement

M.E. Himbert