

# **Detroit Medical Center**

## **Laboratory Automation, Instrumentation & Autoverification: Methods for Maximizing Quality & Efficiency**

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# **Lab Automation, Instrumentation & Autoverification**

- **Good news—improved instrumentation**
- **Wide selection of lab automation systems**
- **Challenge is to select the one that most closely meets your particular needs**
- **Lab automation alone will not produce efficiency**
- **Autoverification—dramatically improving**

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**Children's Hospital**



**Harper & Hutzel Hospitals**



**Huron Valley Hospital**



**Detroit Receiving  
Hospital**



**University Health Center &  
Core Laboratory**

**Orthopedic Hospital**



**Sinai-Grace Hospital**



**Rehabilitation Institute**

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## **Interesting Statistics**

- **8 Hospitals and 1 Institute**
- **1,800 Licensed Beds**
- **3,000 Affiliated Physicians**
- **11,100 Full-Time Equivalents**

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## **General Lab Information**

- **Over 12 million billable tests/year**
- **48% of volume is outreach**
- **< 0.8 % of testing sent to outside labs**
- **Core Laboratory**
  - **Routine & STAT testing**
  - **Specialized testing**
  - **Outreach testing**

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## **Strategies & Objectives**

- **Develop a clear vision**
- **Visit automation sites—apply common sense**
- **Ask if the benefits are worth the cost**
- **Unify methodology across entire system**
- **Apply lean principles & clean up sample flow**
- **Reduce manual handling & transport of samples**



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## **Strategies & Objectives**

- **Consolidate tests from multiple areas**
- **Instruments should function well with and without automation**
- **Instruments should enhance automation**
- **Automation should handle STATs**
- **Support our 29-minute ER initiative**

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## **Strategies & Objectives**

- **Autoverification— essential & not an option**
- **1<sup>st</sup> Generation Autoverification**
- **2<sup>nd</sup> Generation Middleware**
- **3<sup>rd</sup> Generation Autoverification**



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## **Centrifugation**

- **Automation or manual?**
- **Worth the cost? (\$80K-\$120K each)**
- **Is automated or manual centrifugation faster?**
- **To re-centrifuge or not re-centrifuge?**
- **Results of our study**

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## **General Criteria for Selecting Instrumentation for Lab Automation**

- **Long term calibration stability**
- **Highly stable electrolytes**
- **System handles a wide variety of tubes—  
depends on particular environment**

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## **General Criteria for Selecting Instrumentation**

- **Chemical and instrument stability reduces total number of controls**
- **Low maintenance (saves labor)**
- **Maintenance costs inversely related to reliability**

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## **General Criteria for Selecting Instrumentation**

- **Minimize consumables—watch for hidden costs**
- **Disposable tips are very important for automation—no cross contamination**
- **Measure indices—bilirubin, hemoglobin & lipemia**

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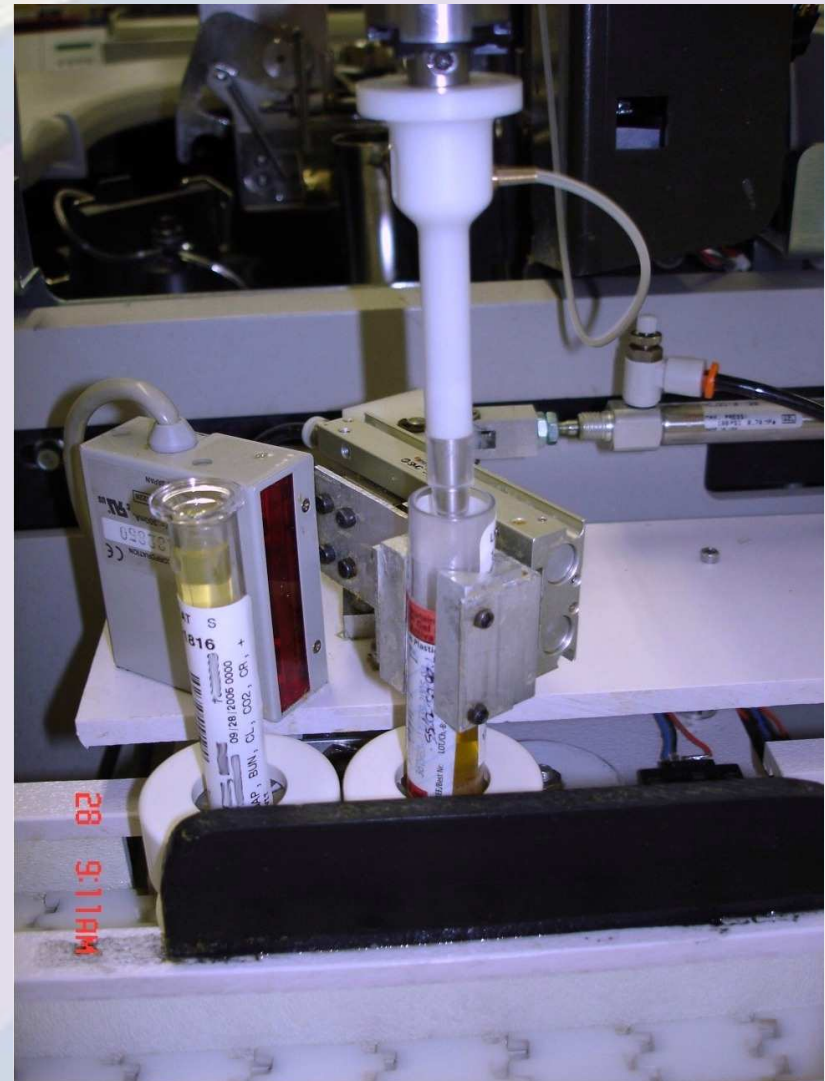
## **Criteria for Selecting Instrumentation for Lab Automation Systems**

- **Clot detection**
- **Low repeat rate—minimizes cost**
- **Highly reliable results over wide dynamic ranges**

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## Criteria for Selecting both Instrumentation & Lab Automation Systems

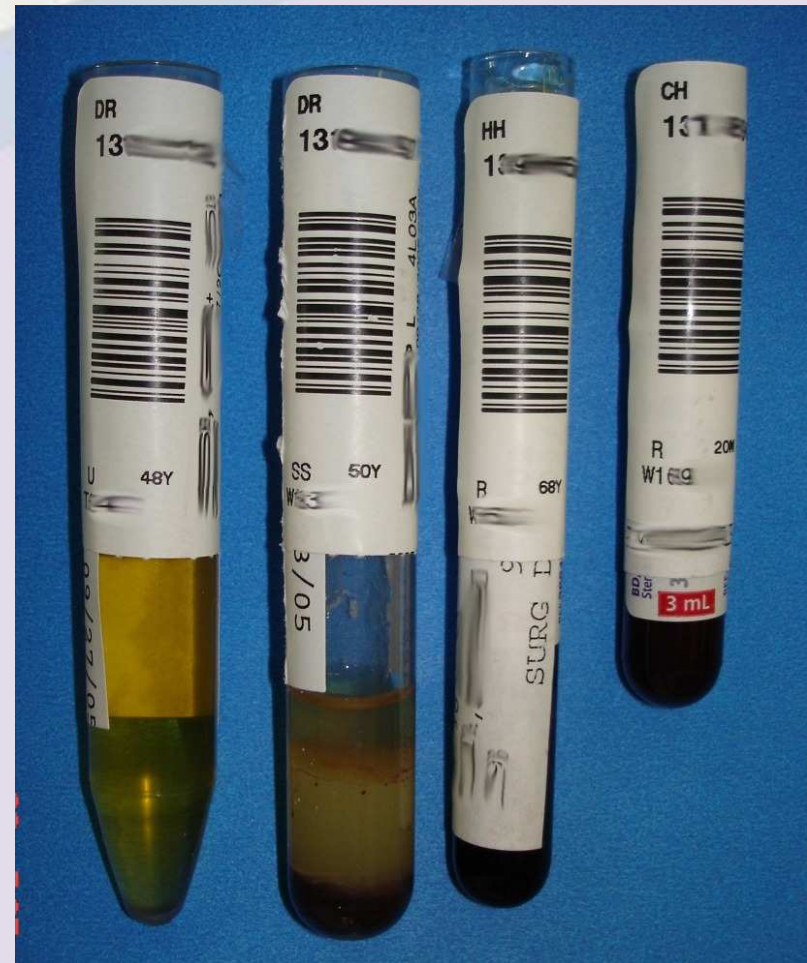
- Direct tube sampling from automated conveyor system
- Extremely important for attaining highest efficiency
- Point-In-Space Sampling



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## Criteria for Selecting both Instrumentation & Lab Automation Systems

- Maximize the number of different tube sizes that can be used with automation
- Very important for attaining high efficiency, especially in competitive outreach market





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## Criteria for Selecting Both Instrumentation & Lab Automation Systems

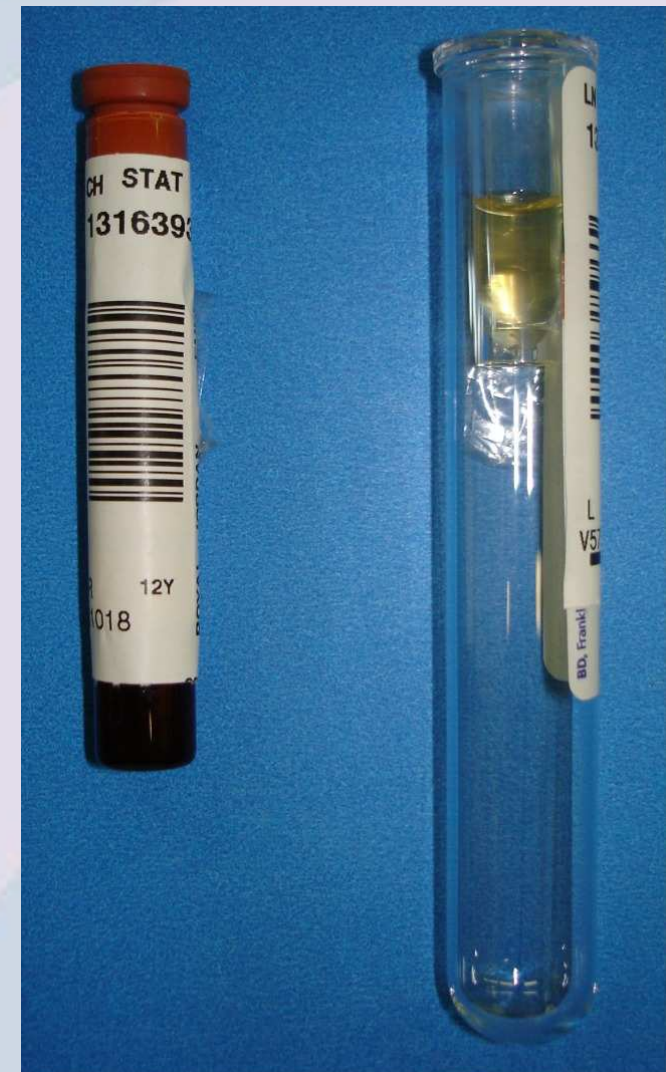
- Short draws are a major source of inefficiency, ~20% samples
- Critical to handle short draws with minimal labor



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## Criteria for Selecting Instrumentation for Lab Automation Systems

- Small tubes in pediatrics  
10 x 65 mm
- Critical to handle most pediatric samples with automation
- Major pediatric hospital in Michigan



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## **Sample Aliquoting**

- **Front or back of automate track?**
- **Is an automated aliquoter worth \$350K?**
- **Are STATS done faster or slower with robotic aliquoter?**
- **More or fewer incidents of QNS?**
- **Does direct tube sampling plus aliquoting at end of automation line provide higher efficiency?**

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## **Robotic Storage**

- **Robot to remove samples from track & place them in storage rack**
- **Robot can remove tube from storage & place back on conveyor for re-testing or add-on tests**
- **Refrigerated storage areas are good but \$\$\$**

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## **History of Autoverification**

### **Earliest Systems Before Autoverification**

**Home grown but powerful (1992)**

**Clearly demonstrated basic principles**

**Allowed complex algorithms using many  
different parameters**

**Clearly notified tech as to nature of problem as  
well as lab policy for correction**

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## **History of Autoverification**

### **1<sup>st</sup> Generation Autoverification**

- **A disappointment but a start**
- **Not enthusiastically supported by LIS**
- **Limited to simple testing to see if a result is within a specified range**
- **Complex algorithms**
- **Major labor savings**



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## **2<sup>nd</sup> Generation Autoverification**

- **“Middleware” created to fill a void**
- **Positioned between instrument & LIS**
- **Allows complicated algorithms or rules**
- **Can examine many results simultaneously**



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## **3<sup>rd</sup> Generation of Autoverification**

- **Philosophy—Provide the user with tools to develop algorithms or rules of their own choosing based on medical experience that can be uniformly applied to each and every result.**
- **Utilize all information that is available to evaluate results before they are released.**
- **Utilize information from EMR such as CC, HPI, family history, medications, etc.**

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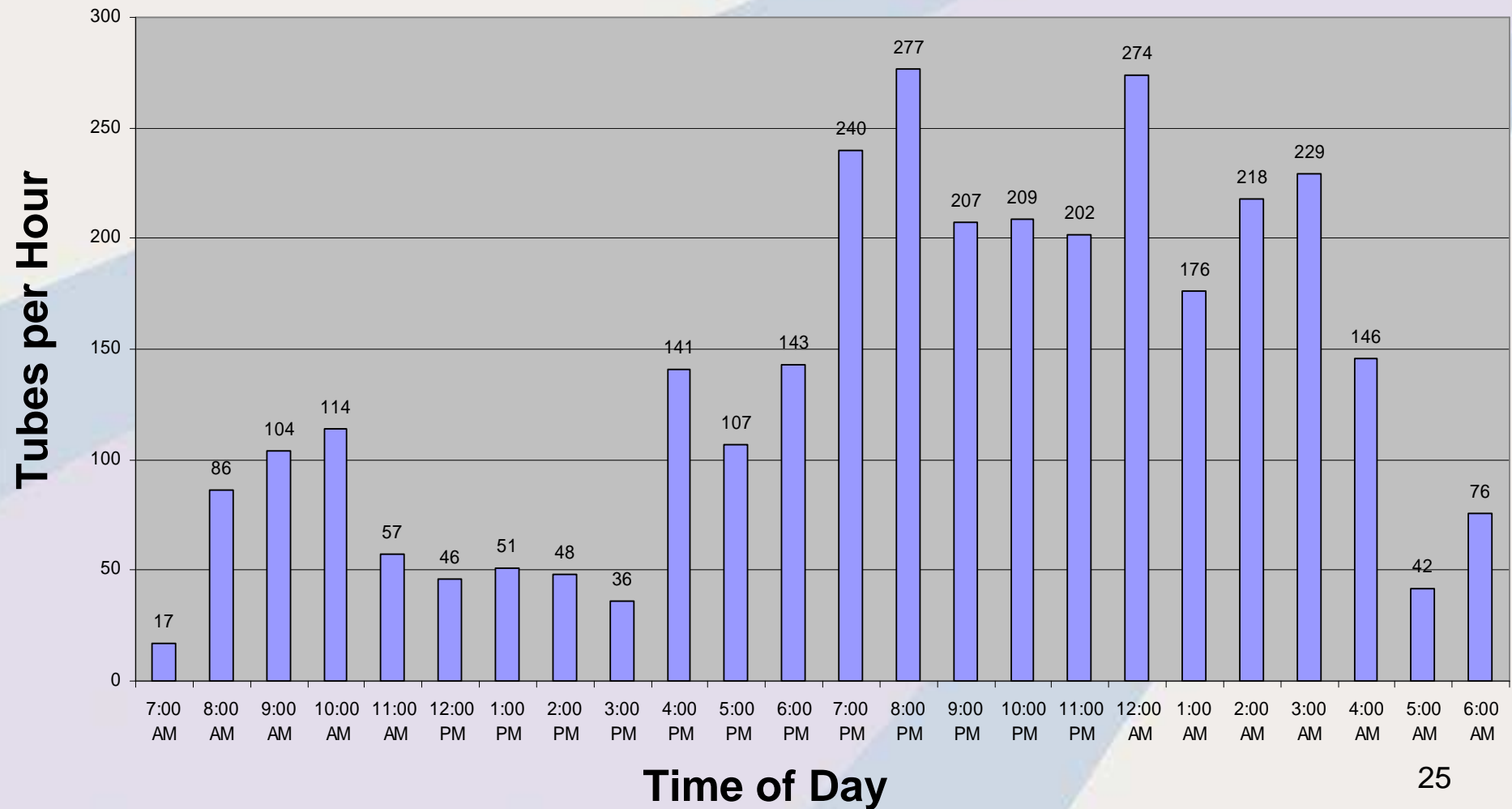
## **Autoverification Statistics**

- **Automated general chemistry**
  - **87 % outreach**
  - **83 % outreach and inpatients (combined)**
- **Automated hematology**
  - **93 %**
- **Coagulation**
  - **81 %**

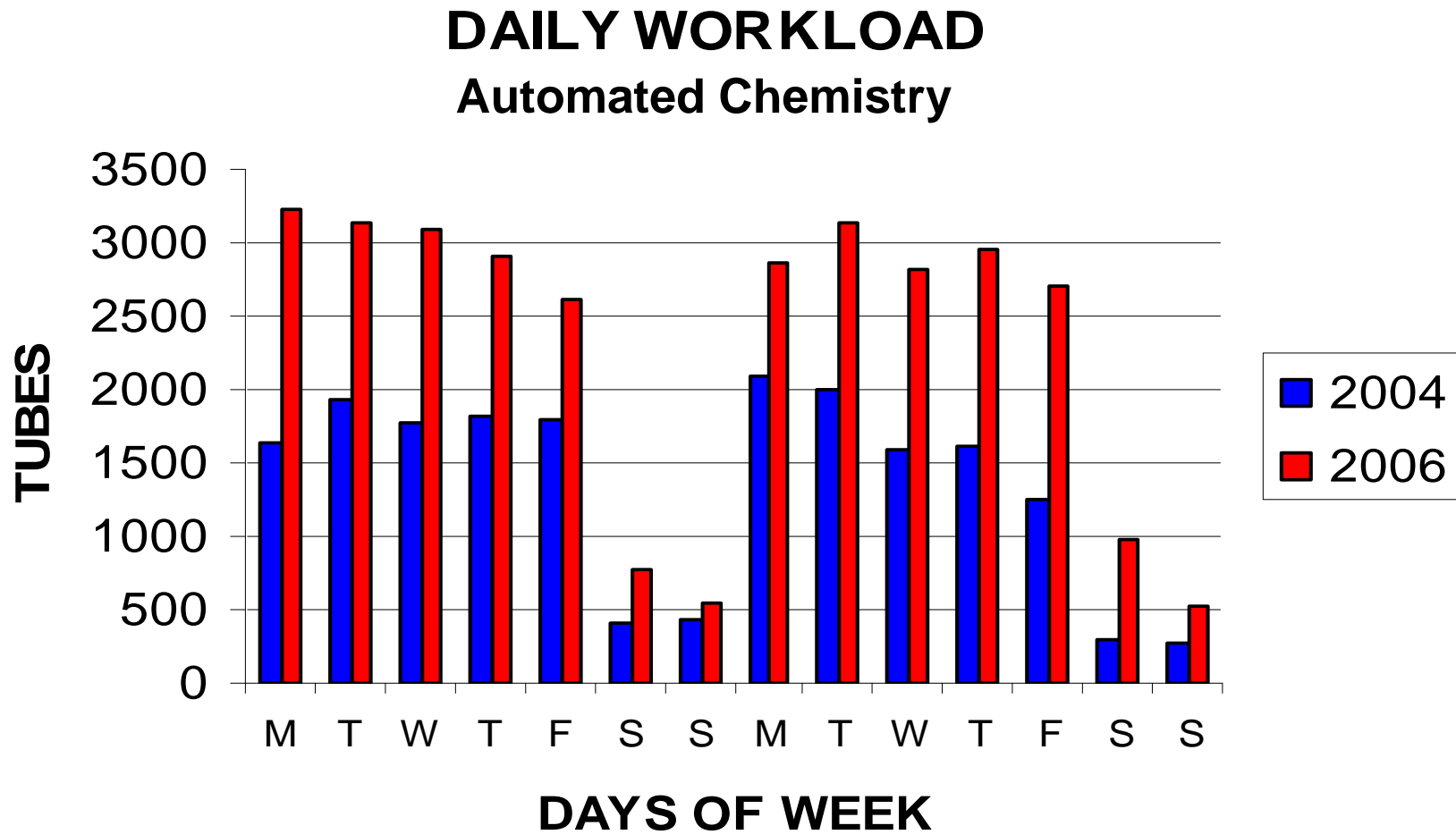
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## Daily Workload Automated Chemistry

Tue 05/15/2007

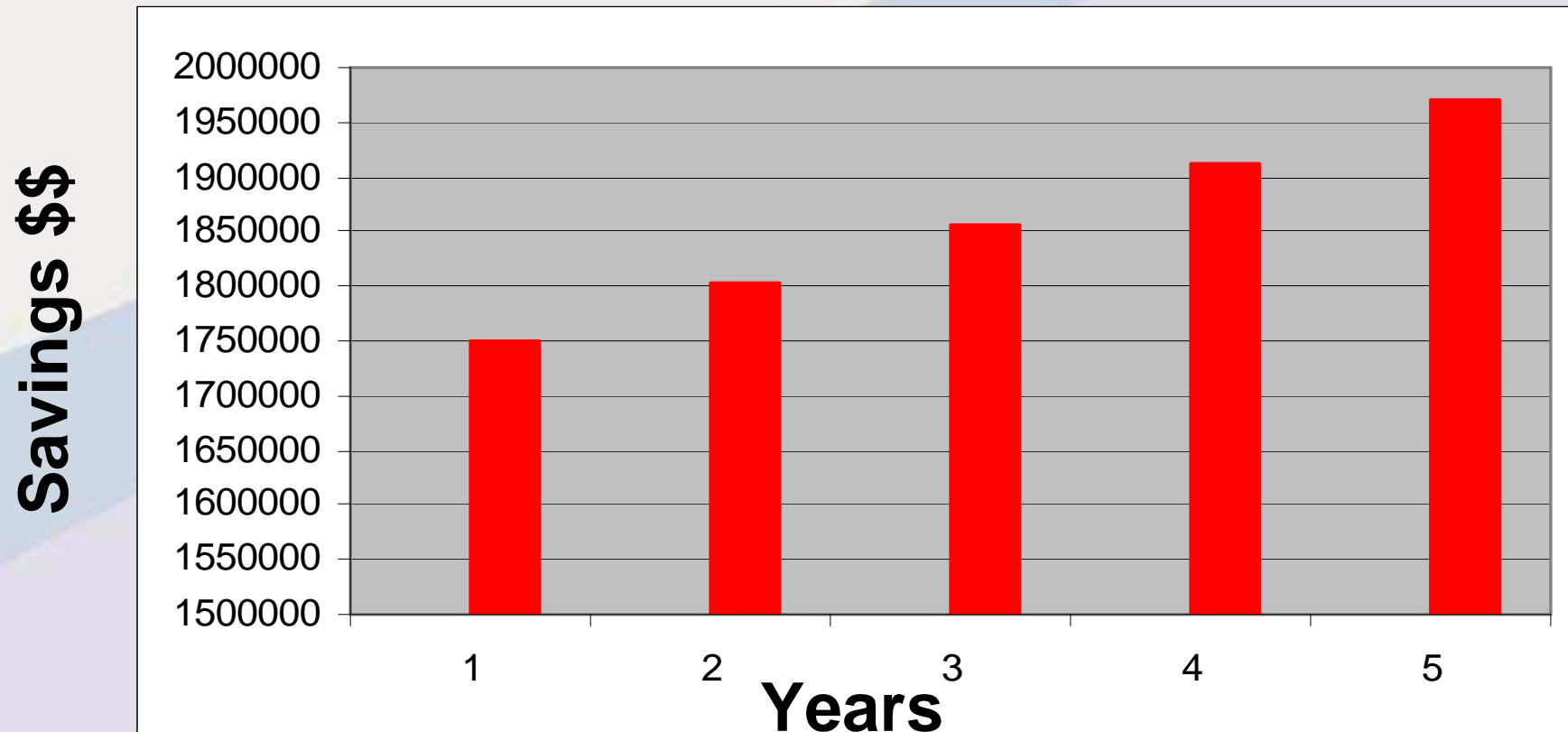


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## Chemistry Savings to Bottom Line



**Over a 5-year period the labor savings is \$9,290,988**

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## Summary

- Significant improvements in service, quality, & efficiency can be obtained by appropriate choices & integration of Lab Automation, Instrumentation, & Autoverification
- The fewer times a sample is touched the higher the efficiency, fewer errors & lower costs
- Questions: [wneeley@dmc.org](mailto:wneeley@dmc.org)

Phone:313-966-0005

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**Thank you**