Micro 7+ Advanced Photometer System

Comparison Study - April 21, 2009

Introduction

An independent laboratory, Catawba Analytical Research Laboratory (CARL*) in Salisbury, North Carolina, was contracted by Industrial Test Systems, Inc. (ITS, Inc.) to perform a comparison study on the ITS eXact® Micro 7+ Advanced Photometer System. This system can be used to test drinking water and other environmental or recreational water samples. All testing was performed by an undergraduate student at the CARL facility using commercially available meters, materials and instructions. The student had no prior experience with the eXact® Micro 7+ system.

Background/ Study design

The new eXact® Micro 7+ Advanced Photometer System was evaluated for performance against commercially available reference methods for the five test parameters listed below.

Test	eXact® Strip	Part #	Reference Methods
Total Chlorine	Micro CL (DPD4)	486670	Hach® Method #8167 (DR890 program #9 - DPD)
pH	Micro pH	486639	Vernier® pH meter
TA	Micro AL	486641	Hach® Method #8203 Digital Titrator
Calcium Hardness (as $CaCO_3$)	Micro CA	486629	AWWA 3500-Ca D EDTA titration method
Copper	Micro CU	486632	Hach® Method # 8506 (DR890 program #20)

A typical eXact® Micro 7+ testing procedure is as follows:

1. Rinse the sample cell with the sample to be tested.
2. Fill the sample cell (4ml) with the sample to be tested.
3. Zero the meter.
4. Select the appropriate eXact® strip for the analyte of interest.
5. Press read. The meter will begin a countdown from 20 seconds. Dip the strip in the sample cell with a gentle back and forth motion to deliver colorimetric or precipitation reagents to the sample.
6. For the direct-read parameters listed above, the meter will then measure the percent transmission at 525nm and automatically convert the value to a result in parts-per million (ppm) or pH units.

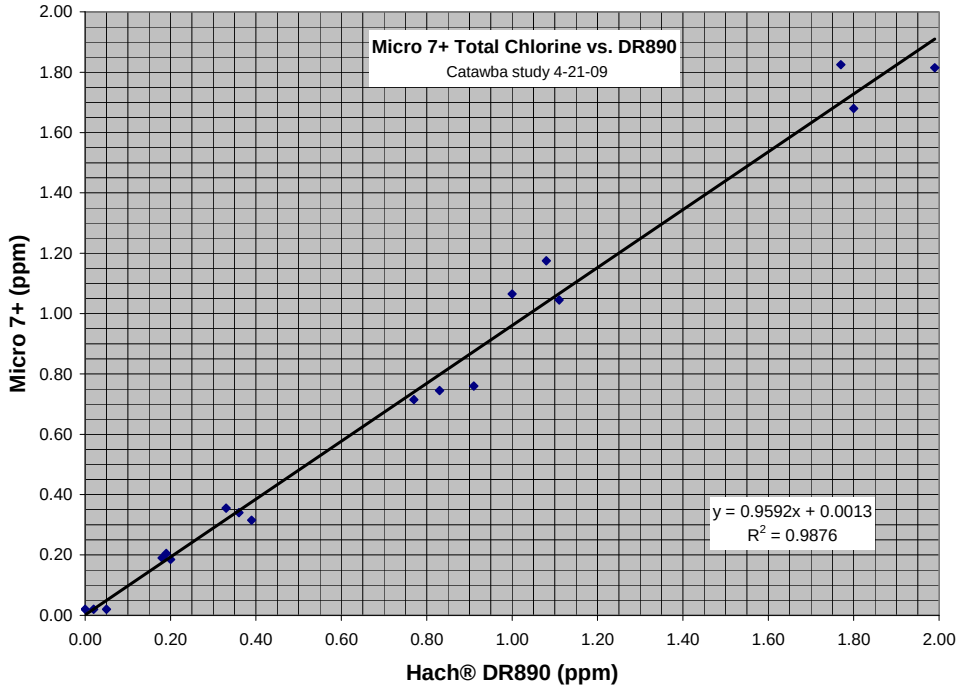
Standards were prepared gravimetrically in tap water to more closely represent real world samples. Total chlorine standards were prepared in chlorine demand-free tap water. All samples were run in triplicate using two eXact® Micro 7+ meters.

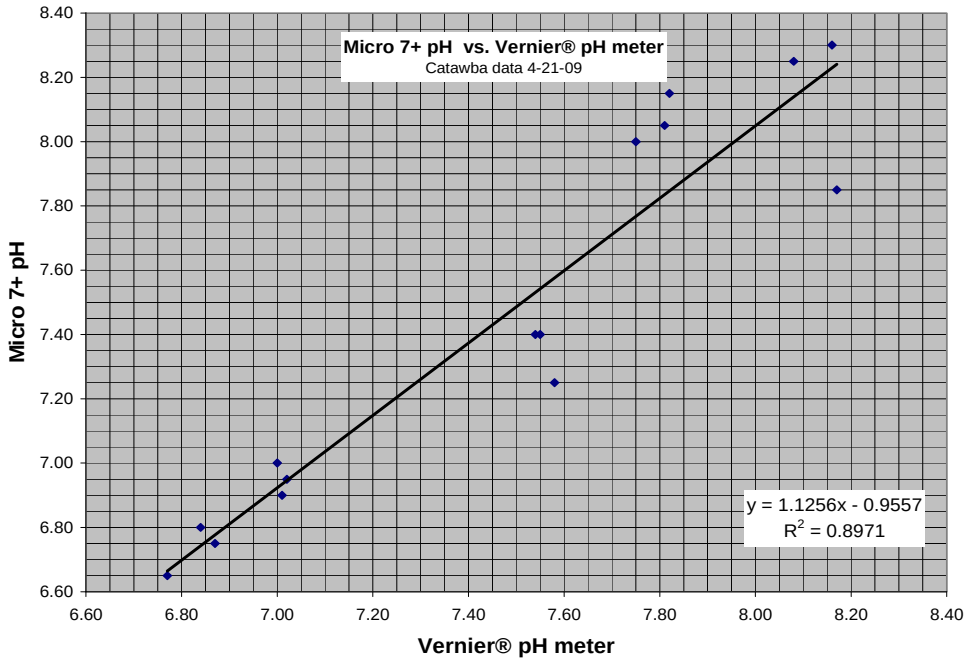
Test	Reagents used for preparing standards
Total Chlorine	Sodium hypochlorite converted to chloramine with Ammonium chloride
pH	Tap water at 90ppm total alkalinity adjusted with 5% HTH™ +/- pH adjustment reagent solutions
TA	sodium bicarbonate
Calcium hardness (as Calcium carbonate)	Calcium chloride
Copper	Copper (II) sulfate pentahydrate

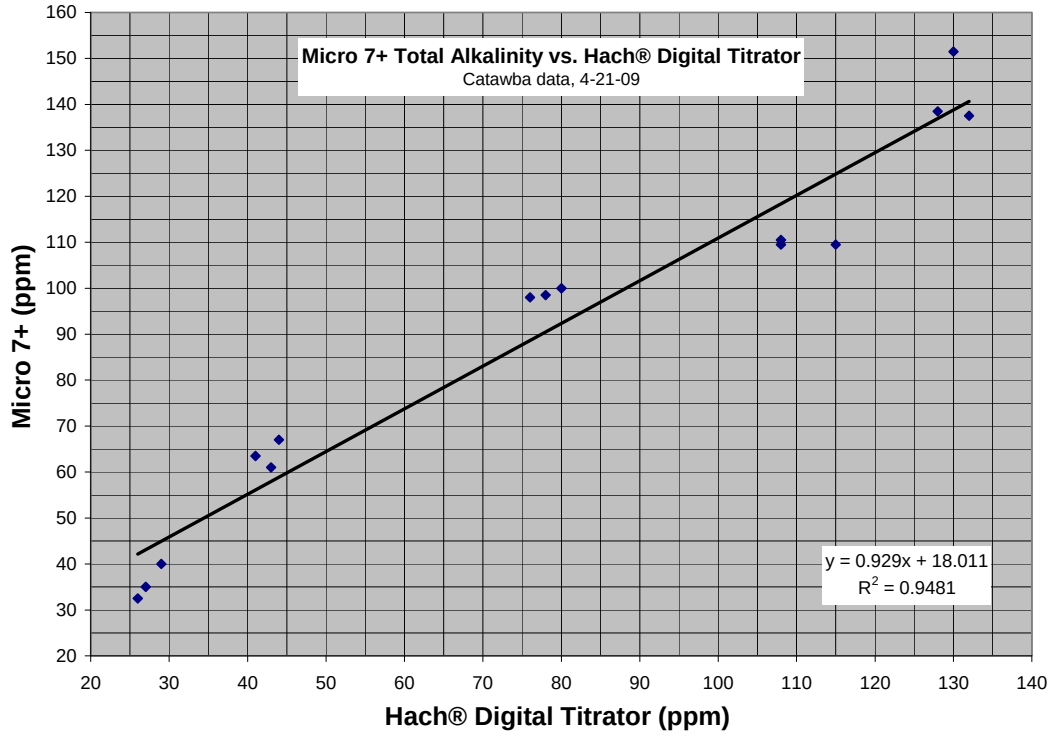
Reference test methods were run in triplicate using the Hach®DR890, Vernier® pH meter, or digital titrator as per the manufacturer's instructions. The calcium hardness titration Method 3500-Ca D is found in American Water Works Association, American Public Health Association and Water Environment Federation *Standard Methods for the Examination of Water and Wastewater*, 18th Ed.

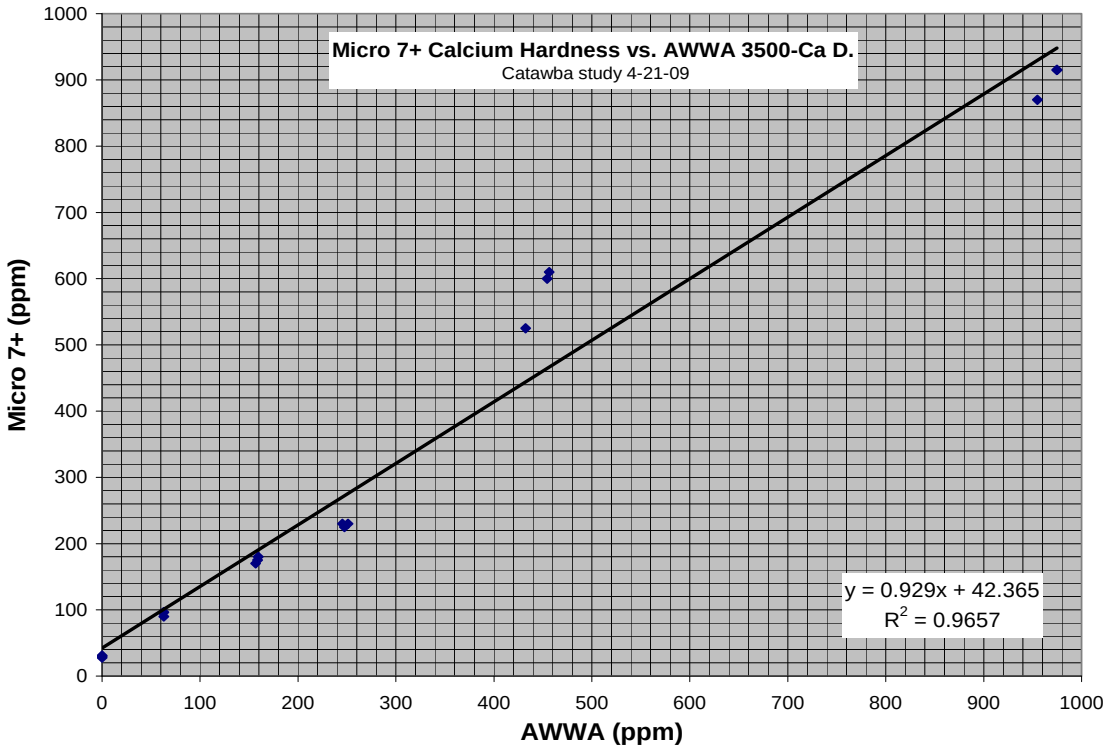
Results

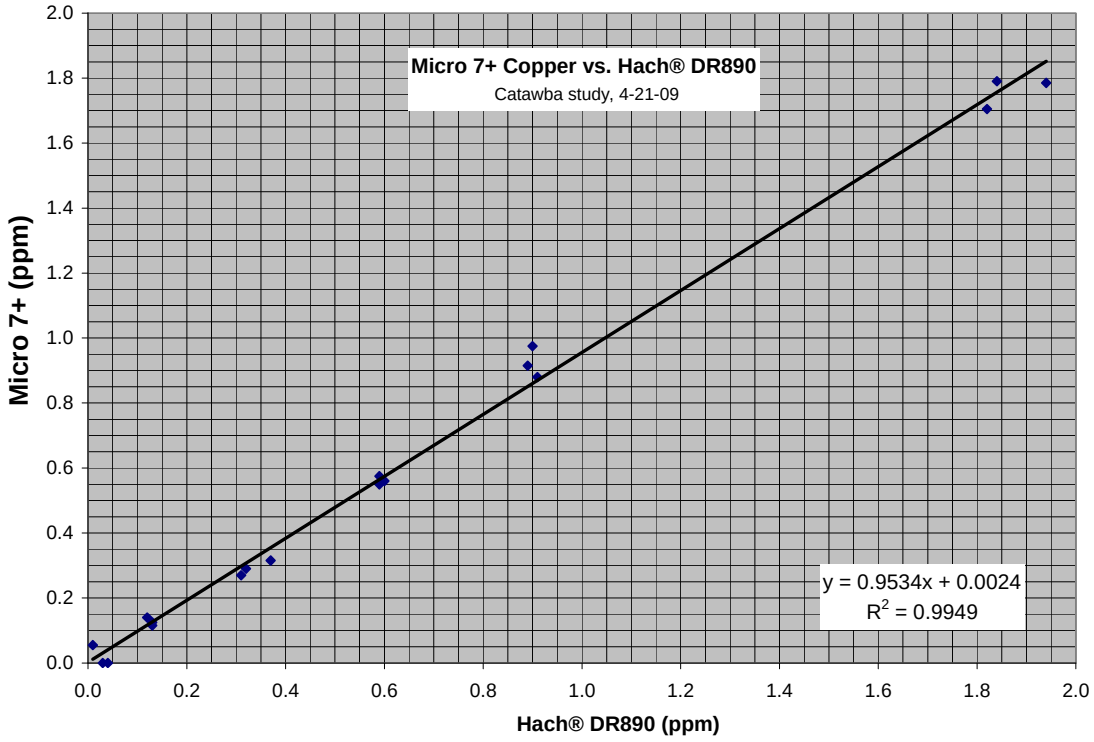
Raw data is available but not included in this report. Comparative results of the eXact® Micro 7+ meter versus the reference method results are presented in the following charts:






Micro 7+ Total Alkalinity vs. Hach® Digital Titrator
Catawba data, 4-21-09
y = 0.929x + 18.011
R2 = 0.9481
Micro 7+ (ppm)
Hach® Digital Titrator (ppm)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
20
30
40
50
60
70
80
90
100
110
120
130
140


Micro 7+ Calcium Hardness vs. AWWA 3500-Ca D.
Catawba study 4-21-09
y = 0.929x + 42.365
R2 = 0.9657
Micro 7+ (ppm)
AWWA (ppm)
1000
900
800
700
600
500
400
300
200
100
0
0
100
200
300
400
500
600
700
800
900
1000



Summary of Results

eXact® Micro 7+	reference	R^2
Total Chlorine	Hach	0.988
pH	pH meter	0.897
Total Alkalinity	Hach	0.948
Calcium Hardness	AWWA 3500-Ca D	0.966
Copper	Hach	0.995

Conclusion

The data from this independent evaluation of the eXact® Micro 7+ Advanced Photometer System shows good correlation with the reference methods.

**ITS, Inc. gratefully acknowledges Director Dr. Mark Sabo and Mr. Nathan Griffin for supplying the raw data ITS used to prepare this report. (Catawba Analytical Research Laboratory, 2300 W. Innes Street, Salisbury, NC 28144, 704-637-4112 mssabo@catawba.edu)*