



Rapid multi-parameter analysis using the new RapidDuo by Man-Tech

Lindsay Peddle

ManSci Inc.

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Load. Start. Done.

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Man-Tech

- Developed the first autotitration system in the world
- Known for creating the “Multi-Parameter System”, which analyzes conductivity, pH, alkalinity, fluoride, etc. from a single sample





New Challenges

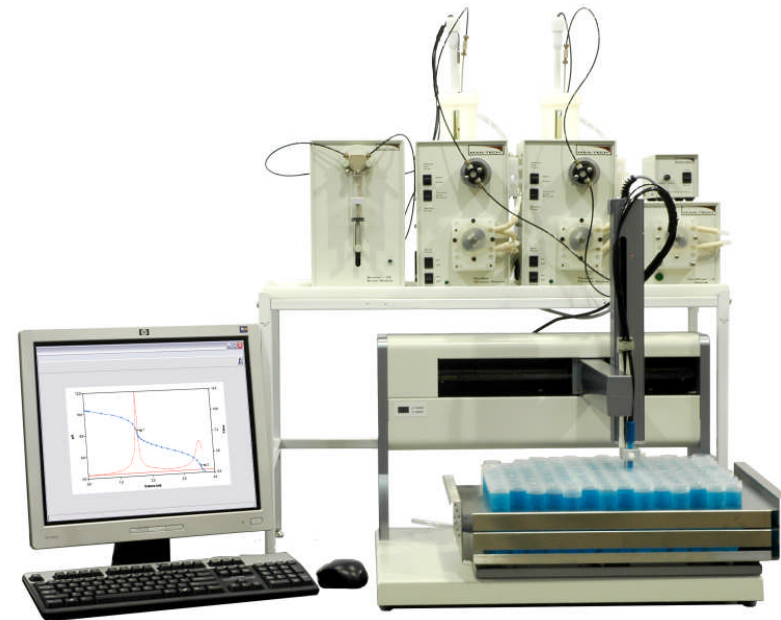
- Report results faster
- Maintain accuracy and precision





RapidDuo

- High-speed version of the PC-Titrate TitraSip system





RapidDuo Features

- Improves analysis times by 50% or more
- Easy to upgrade
- Utilizes US EPA ETV-Verified TitraSip SA Technology
- Follows EPA-Approved methods





RapidDuo System Options

- Stand Alone
- Automated – up to 197 sample positions
- Near-Line





The TitraSip

- One of the key features of the RapidDuo
- Automatic pipetting of the sample into analysis vessel
- Automatic draining and rinsing





The TitraSip

- Upgraded to utilize a smaller, 35mL analysis vessel which requires a smaller sample volume
 - Improved time for pipetting sample
 - Faster titration times



PC-Titrate Software

- Galvanic electrode separation allows for separate but simultaneous analysis
- Ability to control two (or more) TitraSip modules in one system





Order of Events – TitraSip System

- 6mL prime of sample & initial rinse
- Drain excess sample to waste
- 25mL of sample pipetted into vessel
- pH and alkalinity measured/titrated
- Vessel is drained and rinsed



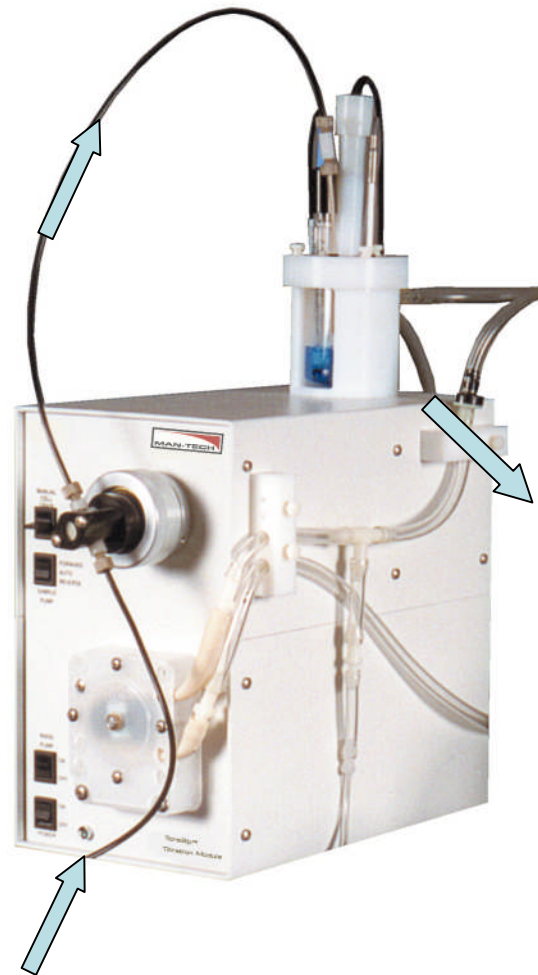
Order of Events – TitraSip System

- 10mL of sample pipetted into vessel with 10mL of TISAB
- Fluoride electrode stabilizes, measurement is recorded
- Drain & final rinse before moving to next sample



pH and
alkalinity are
measured

Fluoride is
measured



Sample drains to
waste and vessel
is rinsed

Sample is pipetted into vessel for pH
and alkalinity analysis
Sample is pipetted into vessel for
fluoride analysis



Load. Start. Done.



Order of Events – RapidDuo System

- 6mL prime of sample & initial rinse occurs simultaneously to 2 different TitraSip vessels
- Both vessels are drained concurrently



Order of Events – RapidDuo System

- 10mL of sample pipetted into vessel #1 containing pH probe, while 5mL each of sample and TISAB pipetted into vessel #2 containing FI probe
- pH and alkalinity measured while fluoride electrode stabilizes

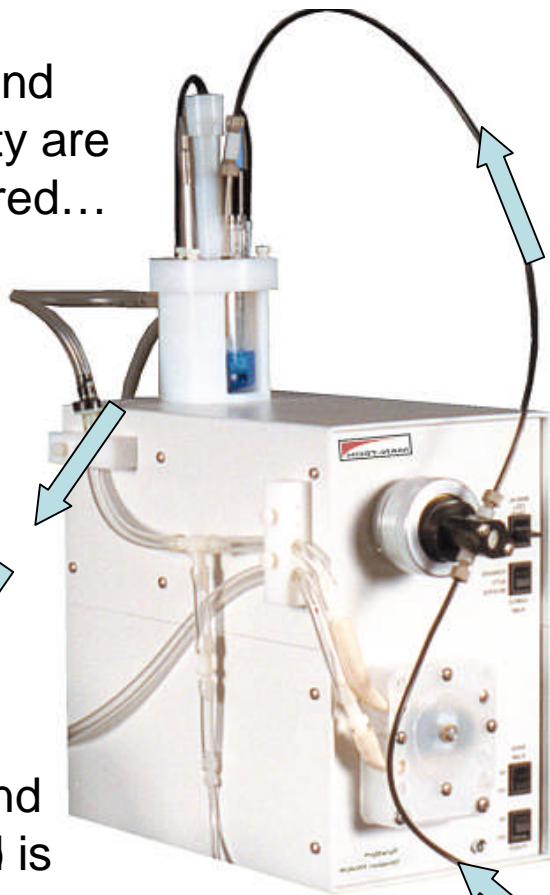


Order of Events – RapidDuo System

- Fluoride reading is taken immediately following alkalinity titration
- Both cells are rinsed and drained

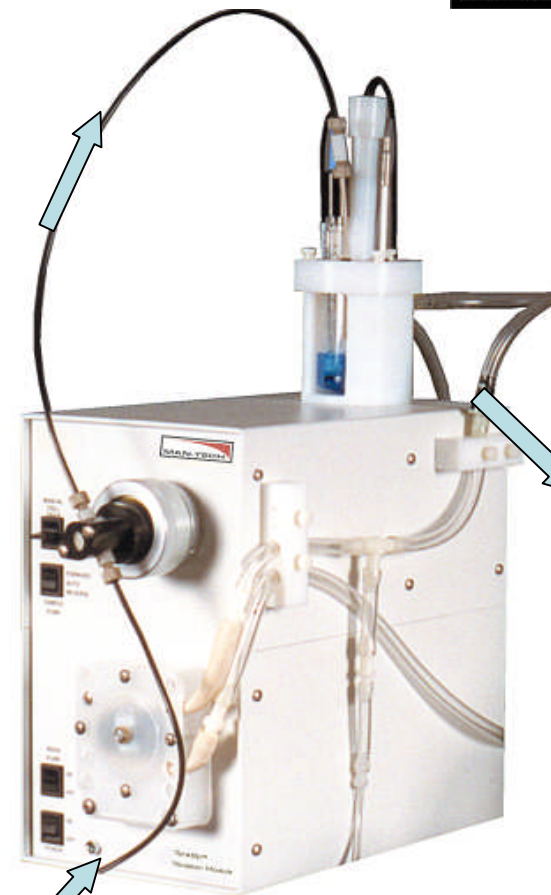


pH and alkalinity are measured...



Sample is drained and the vessel is rinsed

Fluoride result is reported while the fluoride electrode is stabilizing following the alkalinity titration



Sample is drained and the vessel is rinsed



Sample is pipetted into both vessels simultaneously so results for analytes are simultaneous

Load. Start. Done.



Upgrades & Add-Ons

- Addition of other parameters (e.g. turbidity and color)
- SmartCal
- IntelliRinse
- PC-BOD/Titrate Duo





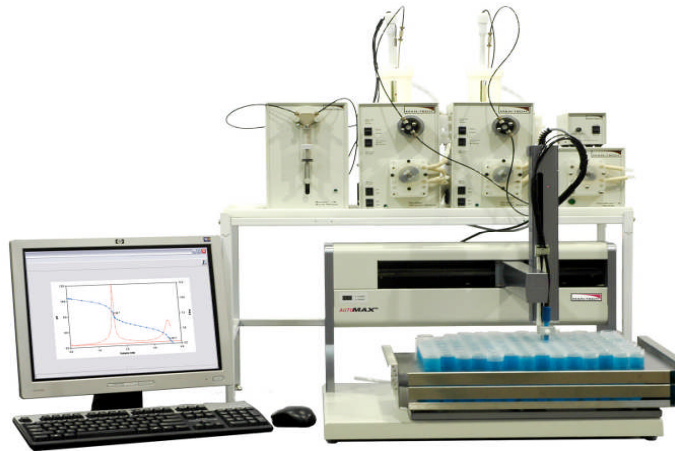
Application Add-Ons

- Turbidity and color can be run “simultaneously”, with stabilization occurring while other parameters are being measured.
- Turbidity can also be run sequentially to save sample volume if time is less important



Application Add-Ons

- Also option to add one or two ion chromatographs (Dionex) for anion and/or cation runs
- Called the TitraSip/IC Duo





SmartCal

- Utilizes a software controlled multi-port valve connected to a pump
- Calibrants are automatically dispensed into the analysis vessel for measurement
- Able to pre-schedule methods





IntelliRinse

- Standard feature of any Man-Tech system
- Ensures that the system and probes are clean before moving on to the next sample
- Rinse to user-defined specification





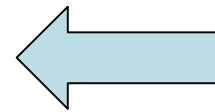
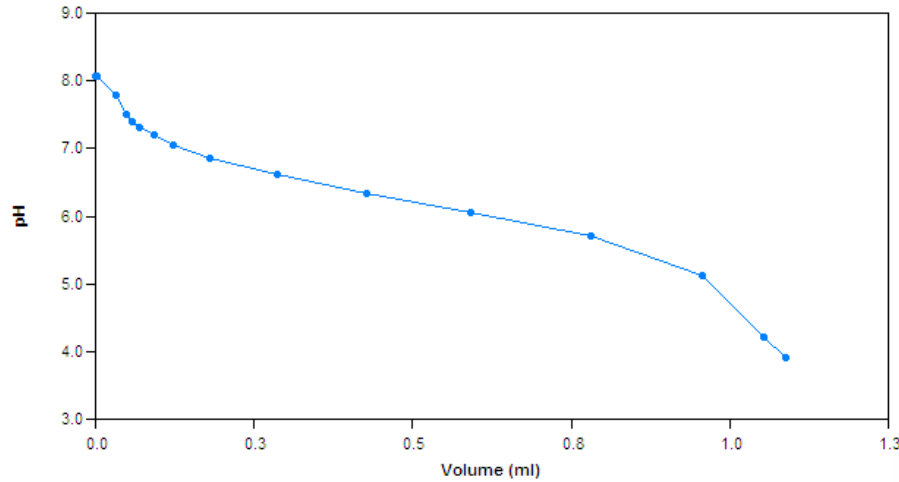
PC-BOD/Titrate Duo

- Analyze BOD in addition to titration and ion analysis from a single system
- Automated options for BOD include automated liquid handling for dilution water, seed and inhibitor
- Run the BODs, then load up and run the inorganics



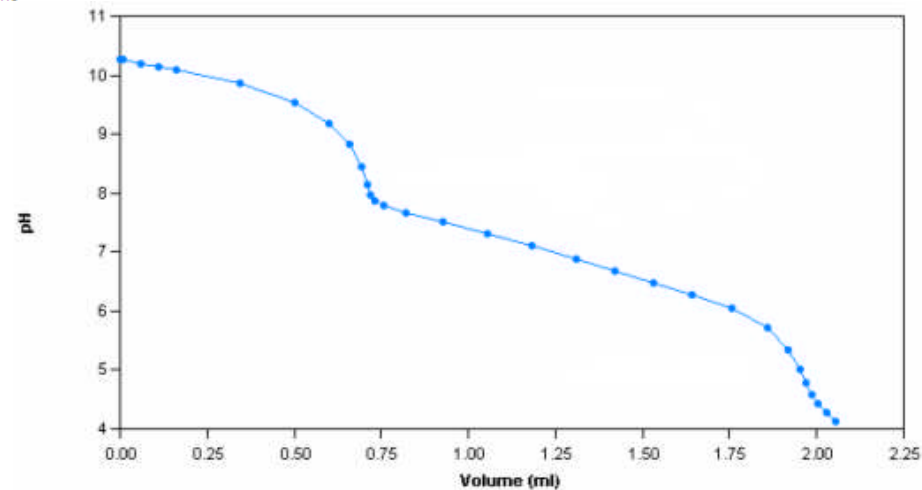


RapidDuo Results



100ppm alkalinity titration curve using the RapidDuo system

100ppm alkalinity titration curve using the TitraSip system





RapidDuo Results

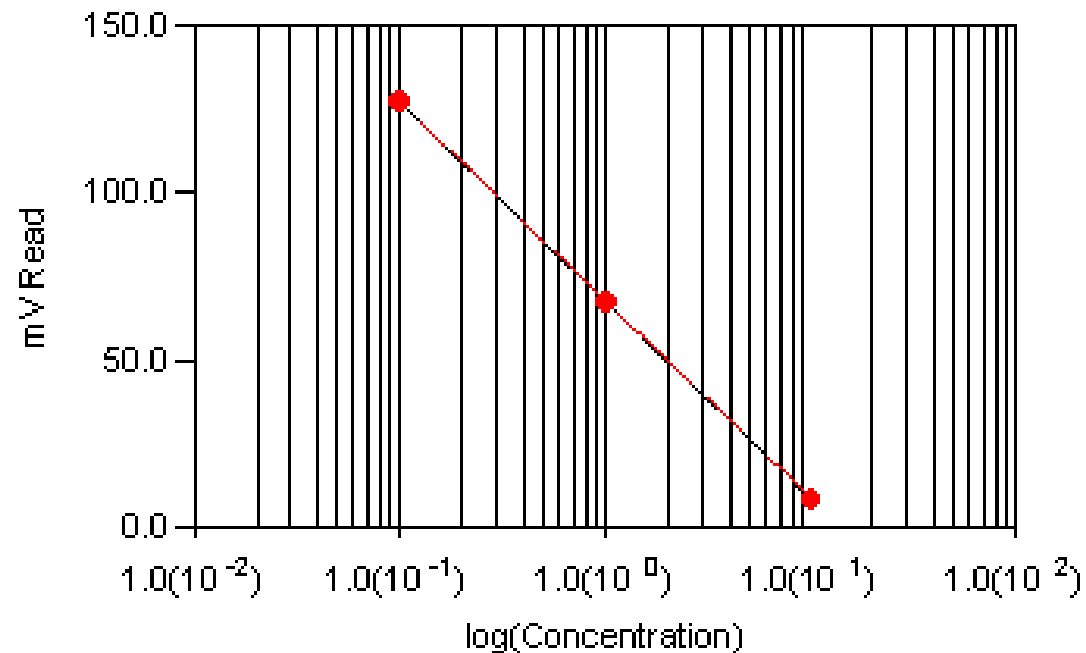
Comparison between alkalinity results when run on the PC-Titrate TitraSip system versus on the RapidDuo system

Alkalinity Concentration	Coefficient of Variance (% CV)	
	PC-Titrate TitraSip	RapidDuo
50ppm	0.60	0.91
200ppm	0.48	0.51
1000ppm	0.72	0.62





RapidDuo Results



A typical fluoride calibration curve from which sample data was obtained





RapidDuo Results

Comparison between fluoride results when run on the PC-Titrate TitraSip system versus on the RapidDuo system

Fluoride Concentration	Coefficient of Variance (% CV)	
	PC-Titrate TitraSip	RapidDuo
1.0ppm	1.57	0.45
5.0ppm	0.46	0.25
10.0ppm	0.66	0.39





RapidDuo System Benefits

- Less sample volume/rinse water
- Improved analysis times for various common EPA-Approved methods
 - Results are delivered to clients sooner
 - Quicker return on investment
 - Increased daily sample load capability





Thank You

Questions?

