Statistical Test Data: ChemSpec 150

1. Repeatability Study

Mean, Standard Deviation and Coefficient of Variation for the MUN determination in 30 samples based on five consecutive determinations.

MUN [mg/dl]	Sd	Cv(%)
8.91	0.205	2.21
10.06	0.147	1.54
10.73	0.108	1.03
11.79	0.150	1.41
12.15	0.132	1.07
13.33	0.160	1.16
13.36	0.190	1.39
14.45	0.156	1.09
14.56	0.180	1.22
16.03	0.172	1.10
16.20	0.144	0.87
17.02	0.187	1.09
18.00	0.167	0.95
18.27	0.306	1.61
18.66	0.175	0.96
18.89	0.232	1.20
18.89	0.272	1.44
19.05	0.152	0.78
19.51	0.202	1.01
20.06	0.211	1.07
20.41	0.112	0.55
21.74	0.179	0.84
21.86	0.293	1.30
22.32	0.211	0.99
23.07	0.420	1.78
23.20	0.321	1.43
24.27	0.342	1.42
24.30	0.383	1.55
25.18	0.161	0.64
25.52	0.214	0.86
Average	0.21	1.19

For more information on ChemSpec, please contact Bentley Instruments or your closest representative.

BENTLEY INSTRUMENTS

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2. Reproducibility Study

Five milk samples analyzed on two instruments over a two-week period.

Reproducibility Study
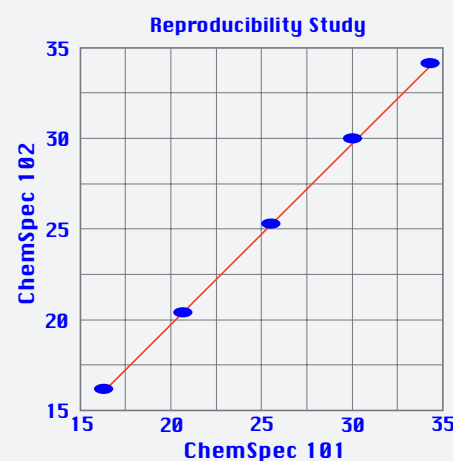
Regression Output

Constant	0.7485
Std Err of Y Est	0.1738
R Squared	0.9995
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	0.96227
Std Err of Coef	0.0116
MDa	-0.00
SDDa	0.15
CVa	0.60

ChemSpec 101	ChemSpec 102	R.E.
15.92	15.88	0.04
20.49	20.64	-0.15
25.31	25.19	0.12
29.99	29.65	0.34
34.77	34.08	0.69
	MDa	0.21
	SDDa	0.32
	CVa	1.26

3. Accuracy Study

Milk Urea Nitrogen concentration determined in 30 samples with an enzymatic reference and the ChemSpec method.

Bentley Chemspec Analyzer Differential Mode
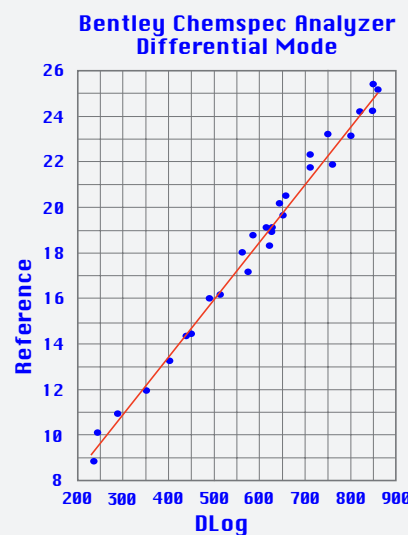
Calibration Statistical Results

Constant	0.000
R Squared	0.9890
No. of Observations	30
Degrees of Freedom	28
X Coefficient(s)	0.02494
Std Err of Coef	0.00050
MDa	0.00
SDDa	0.496
CVa	2.748

4. Recovery Study

Four milk samples were spiked with Urea. The target concentration and ChemSpec results are compared and the Recovery Coefficient calculated.

Bentley ChemSpec Analyzer Recovery Study
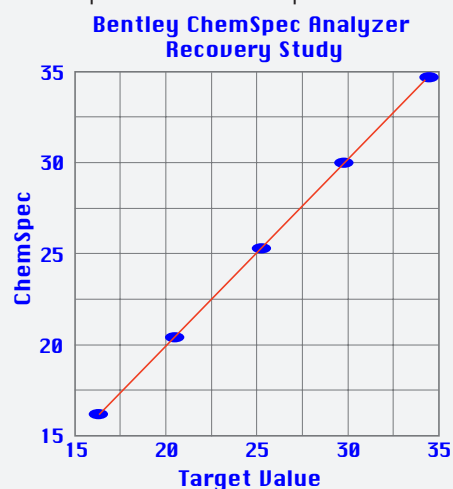
Regression Output

Constant	-0.130
Std Err of Y Est	0.064
R Squared	0.9994
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	1.005
Std Err of Coef	0.0043
MDa	-0.013
SDDa	0.070
CVa	0.276

Spikes mg/dl	Recovered mg/dl	Recovered Percent
4.65	4.57	98.26
9.34	9.39	100.51
13.96	14.07	100.78
18.81	18.85	100.21
	Mean	99.94

ChemSpec™ 150

Fully Automated Milk Urea Analysis

The ChemSpec 150 has been specifically designed for the determination of Urea (or MUN) in milk.

- **Fully Automated and Compact**
- **Capable of Analyzing over 150 Samples Per Hour**
- **Very Low Cost Per Sample**
- **Touchscreen Operation**
- **Enzymatic Methodology**
- **Colorimetric Measuring Principle**

Accurate, compact, fast and reliable, the ChemSpec 150 is the system of choice for milk Urea analysis.

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Analytical Instruments For The Dairy Industry

Technical Overview & Principle of Operation

The ChemSpec 150 utilizes a modified Berthelot reaction to determine the level of Urea in milk.

◆ A small amount of milk is automatically dispensed in a well thermostatted at 40°C. It is then split enzymatically with urease into ammonia and carbon dioxide.

◆ After an incubation time, dye and activator solutions are added to form a green complex. The color intensity is proportional to the ammonia concentration.

◆ The green color intensity is measured spectrophotometrically in a trans-reflectance cell.

◆ The addition of a catalyst in the dye speeds up the reaction, intensifying the green color development, thus enhancing the sensitivity of the method.

◆ The use of a highly precise sample dispenser allows the ChemSpec 150 to bypass a pre-dilution step. The milk is simply diluted in the chemicals used to generate the reactions. This dilution reduces the opacity of the medium, thus improving the spectrophotometric measurement and preventing interference from other milk components.

◆ By alternating measurements of natural ammonia and converted ammonia, the ChemSpec implements a 2-channel FIA. The difference signal from the two measurements allows the ChemSpec to precisely determine the Urea concentration.

◆ A carrousel incubator allows analysis overlap, yielding a capacity of 150 samples per hour.

ChemSpec 150 • Accurate • Compact • Fast • Reliable

Touch Screen

◆ The ChemSpec 150 touch screen is simple, reliable and accurate. Anyone can operate the instrument after a short orientation. The touch screen is resistant to normal wear and usage, and will not be damaged by wet hands.

◆ Touch screen makes program selection and status checks instantaneous.

◆ The ChemSpec 150 can be operated from a standard PC keyboard (not shown).
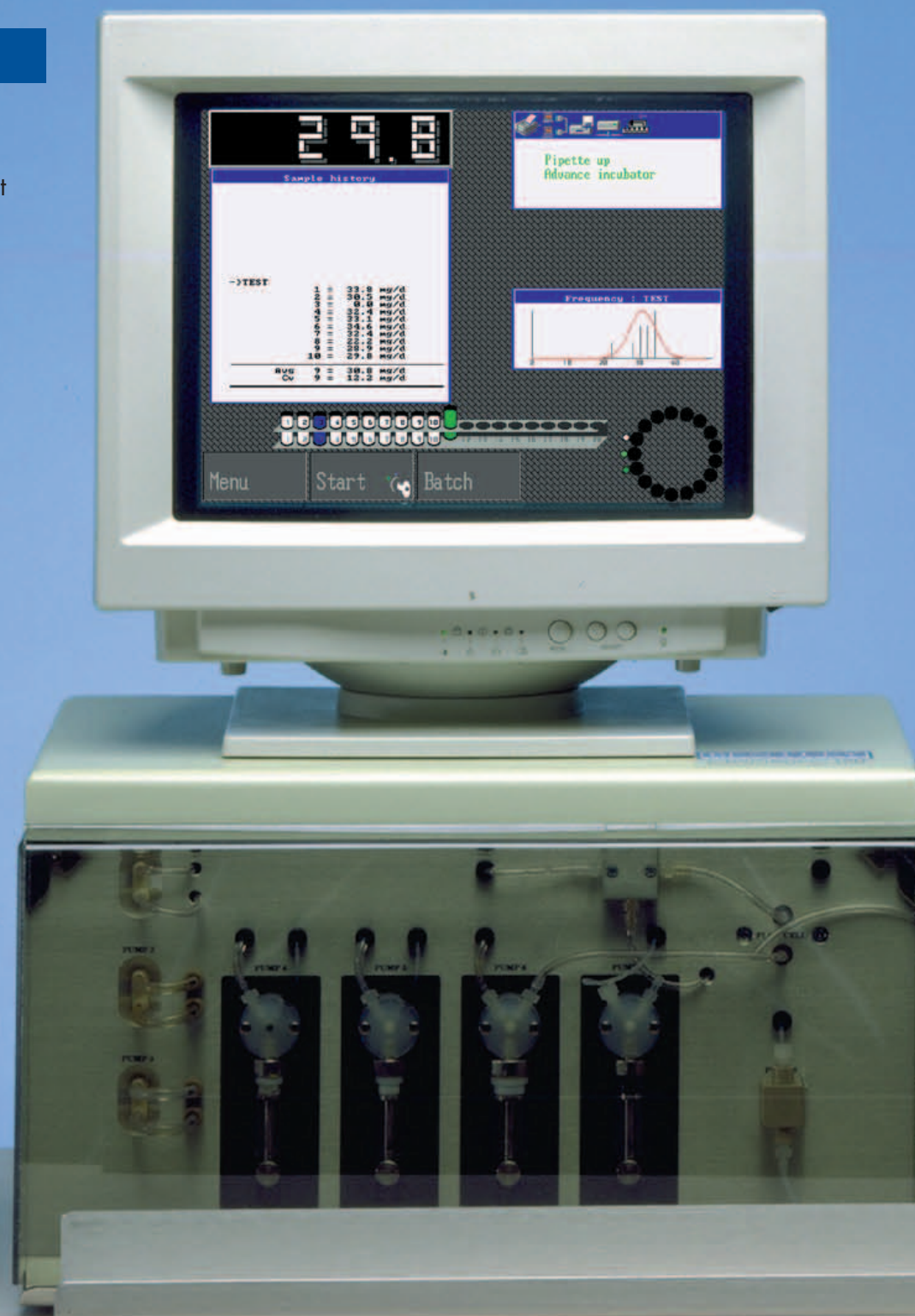
Innovative Design

◆ The 17-well carrousel allows analysis overlap, resulting in a capacity of 150 samples per hour.

◆ A highly precise sample dispenser allows the ChemSpec 150 to bypass a pre-dilution step (milk is diluted in the chemicals used to generate the reactions).

◆ Dilution reduces the opacity of the medium, improving the spectrophotometric measurement and preventing interference with the other milk components.

Automated Sample Input

With the availability of an automated sample handling device, the ChemSpec 150 will provide a complete and highly automated lab procedure, where the work process is easily incorporated into the routine.

◆ The auto-sampler can handle most standard vial sizes.

◆ Optional bar-code readers can be attached to the input tray for automatic sample identification.

Data Output to Screen, Printer or Network

◆ Measurement data from the ChemSpec 150 can be printed on almost any type of printer via the serial and parallel ports.

◆ ChemSpec 150 data output supports most of the standard host-remote solutions used in the industry today.

◆ Bentley Instruments will work with your lab to provide the best possible data integration of the instrument.

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ChemSpec 150 Specifications*

- **Analytical Range:**
  0 - 40 mg/dl MUN
  0 - 86 mg/dl Urea
  0 - 1.43 mM/dl Urea
- **Speed:** 150 per hour
- **Sample Intake:** 2.5ml
- **115 Volts/60Hz/2 Amps**
- **230 Volts/50Hz/1 Amp**
- **Accuracy:** Cv < 5%
- **Repeatability:** Cv < 1.5%
- **Dimensions:**
  Width: 63.0 cm
  Depth: 38.0 cm
  Height: 27.0 cm
  Weight: 23.0 kg

*Specifications for typical raw milk samples.