Savillex Technical Note

Return on Investment: DST-1000 & DST-4000 Acid Purification Systems

Summary

While trace metal grade (1ppb) acids are suitable for digesting or diluting samples prior to analysis with ICP-OES, the lower detection limits of ICP-MS necessitate the use of high purity grade (10 ppt) acid. Over the past few years however, the price of commercial bottled high purity acid has risen significantly, and acid costs have become a significant component of any ICP-MS lab budget. Instead of buying high purity acid, many labs are making significant cost savings by producing it in house using Savillex DST acid purification systems. The DST systems convert less expensive, lower grade acids into high purity acid – safely and efficiently – by sub-boiling distillation. The resulting cost savings can be dramatic: depending on acid type and lab usage, a single DST can save upwards of $300,000 over three years. Return on investment (ROI) calculations, based on DST purchase price, acid usage, and acid costs, are illustrated in this technical note.

Savillex DST-4000 and DST-1000 Acid Purification Systems

ROI Calculations

The DST systems produce 10ppt grade acid for virtually the same cost as the 1ppb grade feedstock acid. Acid prices used are typical discounted prices paid in the US. The monthly cost savings are then applied to the purchase price of the DST (DST-1000 and DST-400 are calculated separately) to give a payback time and subsequent savings. High purity acid costs vary significantly depending on the acid type, with hydrofluoric acid (HF) being the most expensive. Four ROI scenarios are given for both the DST-1000 and DST-4000, as follows:

Scenario	Acid Type	Lab Setup
1	Nitric	Average sized lab using 4 x 500 mL bottles of high purity acid per month
2	Nitric	Large lab using 12 x 500 mL bottles of high purity acid per month
3	Hydrofluoric	Average sized lab using 2x 500 mL bottles of high purity acid per month
4	Hydrofluoric	Large lab using 6 x 500 mL bottles of high purity acid per month

DST-1000 ROI

The cost savings, for an average lab using a DST-1000 to produce high purity nitric acid, will cover the purchase price of the DST-1000 in approximately 3.5 months. This falls to 1.2 months for a large lab. In the case of HF, due to its higher cost, the DST-1000 will pay for itself in only 2.4 months and less than one month in a larger lab. Even more impressive are the cost savings in the first 3 years of use - ranging from $69K to $331K (even taking into account the purchase price of the DST).

Calculate your lab's ROI here: DST-1000 DST-4000

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Return on Investment: DST-1000 & DST-4000 Acid Purification Systems

Scenario 1: Average lab, Nitric	
Price of commercial high purity (10ppt) grade acid (500 mL)	$650
500 mL bottles of high purity acid used per month	4
Price of trace metal (1ppb) grade acid (500 mL)	$120
Monthly acid savings	$2,120
US purchase price of DST-1000	$7,449
Months for DST-1000 to pay for itself	**3.5**
Net savings over first 3 years (DST-1000 cost included)	$68,871

Scenario 2: Large lab, Nitric	
Price of commercial high purity (10ppt) grade acid (500 mL)	$650
500 mL bottles of high purity acid used per month	12
Price of trace metal (1ppb) grade acid (500 mL)	$120
Monthly acid savings	$6,360
US purchase price of DST-1000	$7,449
Months for DST-1000 to pay for itself	**1.2**
Net savings over first 3 years (DST-1000 cost included)	$221,511

Scenario 3: Average lab, HF	
Price of commercial high purity (10ppt) grade acid (500 mL)	$1,700
500 mL bottles of high purity acid used per month	2
Price of trace metal (1ppb) grade acid (500 mL)	$130
Monthly acid savings	$3,140
US purchase price of DST-1000	$7,449
Months for DST-1000 to pay for itself	**2.4**
Net savings over first 3 years (DST-1000 cost included)	$105,591

Scenario 4: Large lab, HF	
Price of commercial high purity (10ppt) grade acid (500 mL)	$1,700
500 mL bottles of high purity acid used per month	6
Price of trace metal (1ppb) grade acid (500 mL)	$130
Monthly acid savings	$9,420
US purchase price of DST-1000	$7,449
Months for DST-1000 to pay for itself	**0.8**
Net savings over first 3 years (DST-1000 cost included)	$331,671

DST-4000 ROI

Payback time for the DST-4000 is slightly longer due to its higher purchase price: 5.7 months for an average lab using nitric acid and 1.9 months for a large lab. With HF, payback time is 3.8 months and 1.3 month in a large lab. The overall savings, however, are similar, ranging from $64K to $327K. The benefits of the DST-4000 over the DST-1000 are: 2x higher production rate (see below), 4x higher acid production per distillation, and auto shutdown at run competion.

Scenario 1: Average lab, Nitric	
Price of commercial high purity (10ppt) grade acid (500 mL)	$650
500 mL bottles of high purity acid used per month	4
Price of trace metal (1ppb) grade acid (500 mL)	$120
Monthly acid savings	$2,120
US purchase price of DST-4000	$12,006
Months for DST-4000 to pay for itself	**5.7**
Net savings over first 3 years (DST-4000 cost included)	$64,314

Scenario 2: Large lab, Nitric	
Price of commercial high purity (10ppt) grade acid (500 mL)	$650
500 mL bottles of high purity acid used per month	12
Price of trace metal (1ppb) grade acid (500 mL)	$120
Monthly acid savings	$6,360
US purchase price of DST-4000	$12,006
Months for DST-4000 to pay for itself	**1.9**
Net savings over first 3 years (DST-4000 cost included)	$216,954

Scenario 3: Average lab, HF	
Price of commercial high purity (10ppt) grade acid (500 mL)	$1,700
500 mL bottles of high purity acid used per month	2
Price of trace metal (1ppb) grade acid (500 mL)	$130
Monthly acid savings	$3,140
US purchase price of DST-4000	$12,006
Months for DST-4000 to pay for itself	**3.8**
Net savings over first 3 years (DST-4000 cost included)	$101,034

Scenario 4: Large lab, HF	
Price of commercial high purity (10ppt) grade acid (500 mL)	$1,700
500 mL bottles of high purity acid used per month	6
Price of trace metal (1ppb) grade acid (500 mL)	$130
Monthly acid savings	$9,420
US purchase price of DST-4000	$12,006
Months for DST-4000 to pay for itself	**1.3**
Net savings over first 3 years (DST-4000 cost included)	$327,114

DST Production Rate

Even for larger labs, acid usage is typically far below the production rate of the DSTs. The DST-1000 can produce 500 mL of high purity acid in around 12 hours, compared to 6 hours for the DST-4000. For labs that use large amounts of high purity acid for trace metal sample prep, in addition to ICP-MS standard prep and sample dilution, the savings are even more dramatic.

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