

Tools To Financially Justify Calibration Equipment

How To Justify Acquiring or Expanding
Calibration Instruments & Capabilities

Teleconference:

US & Canada Toll Free Dial-In Number: 1-(866) 230-5936

International Dial-In Number: +1-720-2395774

Conference Code: 1010759559

Welcome



Greetings from —

Fluke Corporation

Everett, Washington, USA

We are very pleased to bring you this presentation on financially justifying calibration equipment.

Welcome and Thanks!



This presentation is based on Fluke's extensive experience with:

- **Calibration Instruments**
- **Calibration services we provide to the test and measurement industry**
- **Our experience and understanding of the problems faced when considering both the investments for & benefits of equipping calibration labs**

Thanks for your time, we hope you find it both valuable and useful.

Presented by



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and Jack Somppi

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Fluke Precision Measurement Web Seminar Series

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Our Seminar Topics Include:

- Precision Measurement Techniques
- Oscilloscope Calibration
- General Metrology
- Temperature Calibration
- Metrology Software
- RF Calibration

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Fluke Precision Measurement Seminar Series

The FPM Seminar Series is a series of free seminars on topics of interest to calibration professionals. Seminars are most often offered as web seminars, so they are easy to attend - you don't even have to leave your office.

Seminar schedules and registration

Course descriptions

<p>Precision Measurement Techniques</p> <ul style="list-style-type: none"> > Improving calibration test ratios using a reference multimeter > Replacing analog null detecting meters in voltage reference intercomparisons > The reference multimeter and ratio measurements 	<p>Temperature Calibration</p> <ul style="list-style-type: none"> > Introduction to temperature calibration > Secondary temperature calibration equipment requirements and financial justification > Temperature uncertainty budgets and how to use them
<p>Oscilloscope Calibration</p> <ul style="list-style-type: none"> > Techniques for Oscilloscope Calibration using dedicated or Multiproduct Calibrators 	<p>General Metrology and Business Topics</p> <ul style="list-style-type: none"> > Applying measurement uncertainty to digital multimeter calibration > Tools to financially justify calibration equipment
<p>Metrology Software</p> <ul style="list-style-type: none"> > Managing your MET/CAL software procedures with the Quick Sort utility program > Understanding and using MET/CAL sub-procedures and procedure flow statements 	<p>RF Calibration</p> <ul style="list-style-type: none"> > Precision RF sourcing: How to cut RF calibration time in half for spectrum analyzers and RF measurement instrumentation

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- There will be an opportunity throughout the discussion to pause and ask questions.
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Tools To Financially Justify Calibration Equipment

How To Justify Acquiring or Expanding
Calibration Instruments & Capabilities

Objectives

With this session you will

- **Learn a variety of financial considerations important when justifying in house calibration,**
- **Study detailed examples of costs associated with calibration of test instrumentation**
- **Understand how to relate these considerations in a proper perspective for management review**
- **Have analytical tools to use when doing the financial analysis for such decisions**

Benefits

- **You can better understand management's perspective and key values – which will simplify the equipment justification process.**
- **Have the analysis tools and the financial model to simplify the task of getting the facts needed for justification**

Overview

- Topics included:
 - **Management's perspective to justification**
 - **The costs of calibrating test instruments**
 - **Cost of ownership for calibration equipment**
 - **A spreadsheet tool for cost analysis**
 - **Study an example Capital Appropriation Request Form**

Management's Perspective To Justification

**What is the information that management needs for
capital investment?**

The justification challenge -

How Do You Justify Calibration Equipment When -

- The needs aren't fully understood
- No budgets are available
- You face technical priorities that seem to conflict with business strategy
- You are a metrologist and don't have an MBA in finance
- Nobody likes change
- The first four questions from the boss are –
 - Why..., Why..., Why..., and Why...
- The first four answers from the boss are -
 - No! No! No! and No!



The objective

To get to YES ...
your management
needs good
answers to all the
“why’s” they ask
about your request



What answering management's "WHYs" means -

- Describing what you want to do and **WHY** is it important?
- Knowing what are you are doing today & **WHY** your solution is better?
- Understanding **WHY** this solution is better than the alternatives?
- Knowing **WHY** & how is it financially better for the company?
- Understanding **WHY** it fits with our ways of doing business?
- Why, why, why



Your answers must make business sense

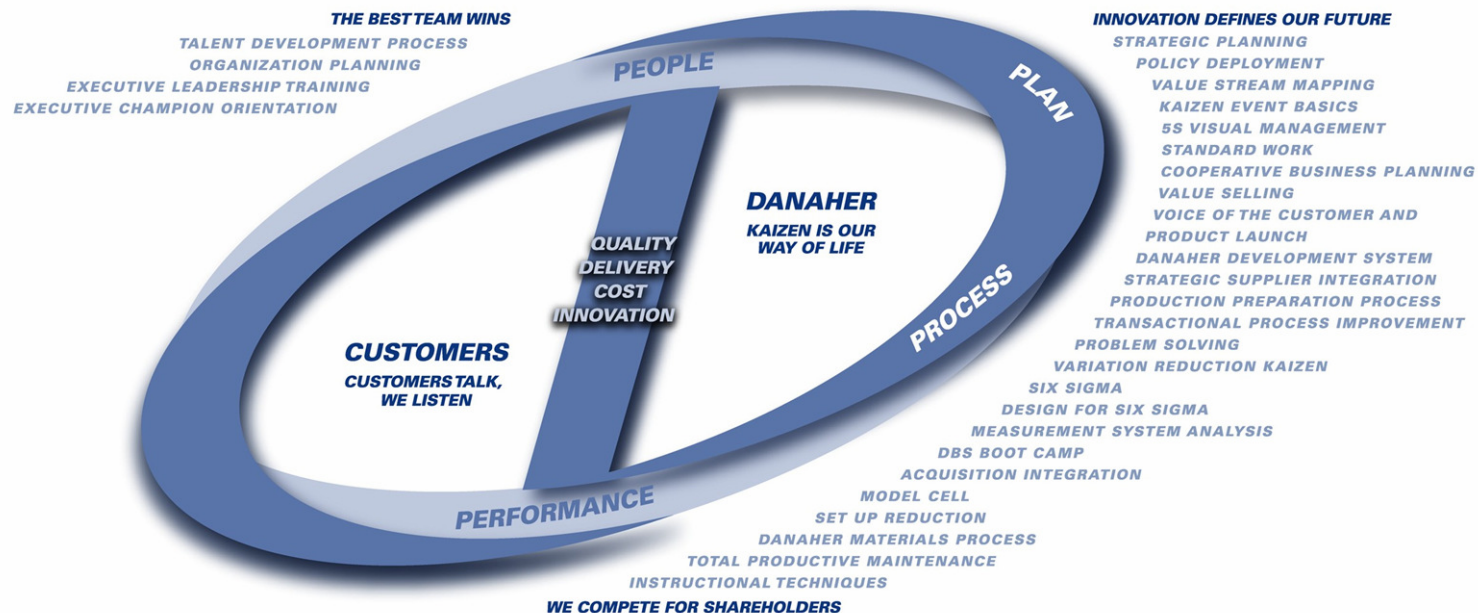
- Your answers to the “Whys” must reflect your organization’s business philosophy
- Fitting your business rationale is *“Must Do”* for a successful justification

For Example - Fluke’s business rationale is based on the Danaher Business System (DBS) – the business philosophy of our parent company, the Danaher Corp.



Introducing the DBS philosophy

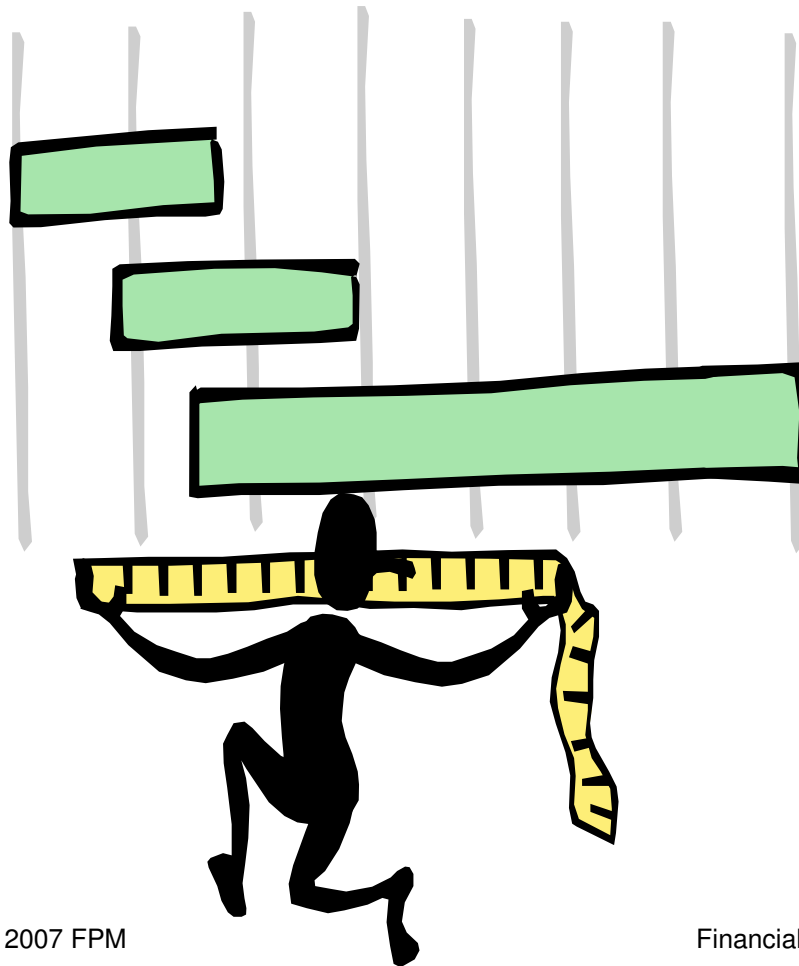
DANAHER BUSINESS SYSTEM



- A lean process modeled on the Toyota Production System
- DBS includes many business tools, including those for Strategic Planning, Policy Deployment, Kaizens, and 6 Sigma

What is Fluke striving for with DBS?

“Continuous Improvement With a Purpose”



Eliminate Waste
Improve Quality
Improve Delivery
Reduce Cost
Drive Innovation

Results in
**Significant, Measurable
Improvements**

... that are sustainable!

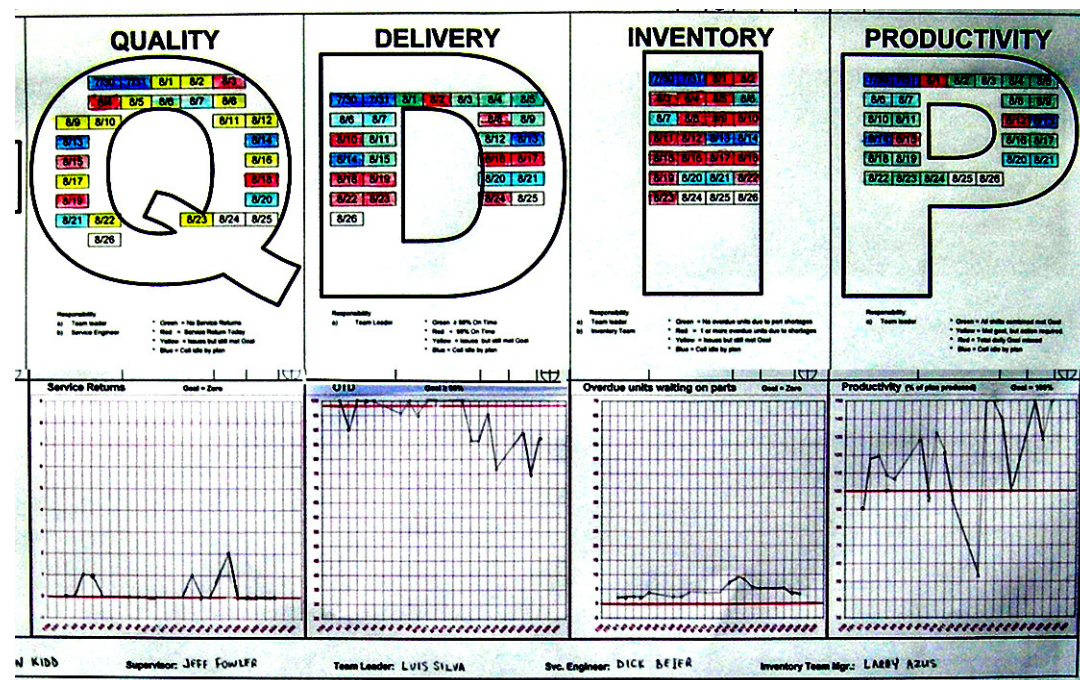
How to have proof – show significant & measurable improvement

- Measurable Improvements Require Good Metrics...
- Good Metrics Require Key Performance Indicators...
 - **Focus on the customer**
 - **Reflect the purpose and scope of the process**
 - **Are simple and repeatable**
 - **Track progress to goals**
 - **Are accepted as fair and helpful**
 - **Lead to action!**

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Fluke's calibration & service lab's key performance indicators

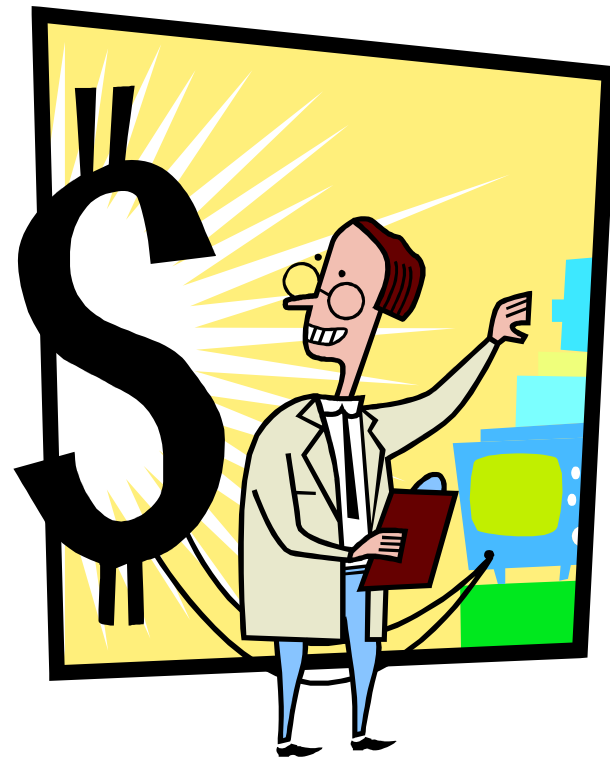
- Quality
 - Service Returns
- Delivery
 - On Time Delivery
- Inventory
 - Overdue Units Waiting On Parts
- Productivity
 - % of Plan Produced



What are the indicators of proper performance in your laboratory?

Suggestions from experience -

- What do your “customers” expect?
- What are the key performance indicators of your higher management?
- What are indicators used by similar groups in your own organizations?
- And so on....



Sets summarize the benefits of using metrics & indicators

These tools will let you know -

- What you do
- How well it is working
- When you have a problem
- Where to improve
- Helps you prioritize improvements
- **Gives you a factual basis for making & justifying changes – and answering the critical “WHY’s”**



The Costs Of Test Instrument Calibration

What are the costs of calibrating your test instruments?

Measurable costs for calibrating test instruments

- Direct Calibration costs/expenses
 - Internal Costs for time and materials
 - External Costs paid to Outside Calibration Service Providers
 - Certifying Unsupported Test Instruments
 - Certifying Internal Calibration Standards
- Indirect costs due to lost usage & instrument down time, overhead & burden, etc.
- Financial costs, such as depreciation expense

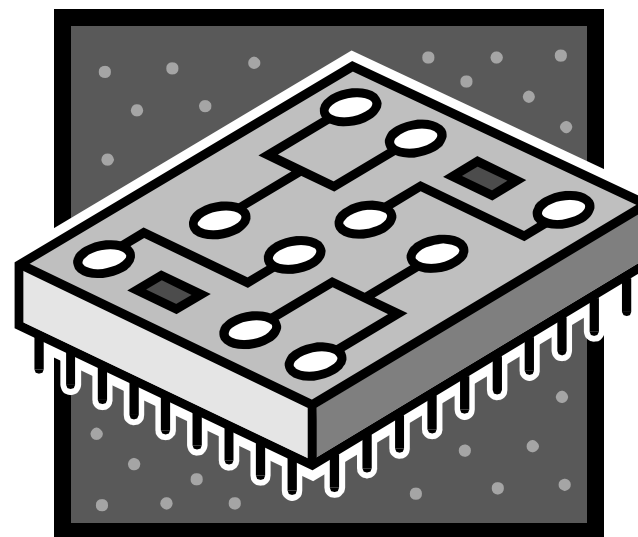


Example 1 – Establishing in house calibration

We will study ACME Electronics Company, a small but growing manufacturer of electronic widgets

ACME's basic instrument workload profile:

- 100 simple handheld dmms performance checked yearly
- 75 moderately accurate bench dmms calibrated yearly
- 50 more accurate system dmms calibrated every six months
- Other common workload like thermometers, oscilloscopes, chart recorders, data acquisition units etc. will not be considered in this simple example – but would add more strength to a justification



Existing costs for outside calibration services

Class of Instrument	Calibration with a Simple Certificate	Accredited Calibration with Data	Internal Admin Time & Matl. Costs	Basic Cost Per Instrument
3½ Digit Simple DMM (0.1% DCV)	\$60	\$100	\$30	\$90 - \$130
4½ - 5½ Digit Moderate DMM (0.025% DCV)	\$100	\$200	\$30	\$130 - \$230
5½ - 6½ Digit Complex DMM (0.004% DCV)	\$200	\$400	\$40	\$240 - \$440

How much \$\$ is spent in a year?

Direct Expenses Are Based Upon-

- Total Workload of Items Calibrated
- Number Of Times Calibrated Per Year
- Type Of Certification Required

Indirect Expenses

- Administrative Work & Materials
- Technical Management



ACME's annual cost for an outside calibration service

Class of Instrument	Cost For Calibration	Items in Workload	Calibrations Per Year	Annual Cost
3½ Digit Simple DMM	\$90 (Basic Cal)	100	1 (100 total)	\$9000
4½ - 5½ Digit Moderate DMM	\$230 (Accredited)	75	1 (75 total)	\$17250
5½-6½ Digit Complex DMM	\$440 (Accredited)	50	2 (100 total)	\$44000
Total		225	275	<u>\$70250</u>

Can ACME spend this money more wisely?

- This example workload represents a operating expense of approximately \$70K for multimeters alone
- **Alternative #1: Have an annual calibration contract with one or more specific calibration & service providers**
 - Typical savings of 10 to 20 percent over single piece pricing
 - Contract for both calibration & repair support for a one fixed price – a solution to simplify the annual instrumentation support budget
- **Alternative #2: Do-It-Yourself Calibration (DIY)**
 - These costs are often shown to be much less than the annual out of house calibration expenses
 - Yet the setup & operating costs to bring this workload in house are not trivial and must be justified to management



Business gains through DIY calibration

- Less instrument downtime & a faster calibration turn around time on every instrument
- Lower cost for every instrument calibrated
- More control over calibration quality
- Better management of calibration tests requirements,
- Better understanding of factors influencing the quality impact when solving calibration problems
- THESE ARE SOME OF THE ANSWERS TO THE “WHYs”



ACME's direct costs for DIY calibration vs. outside cal

Class of Instrument	Technician's Calibration Time	Administrator's Time	Internal Admin Time & Material Costs	Example Outside Costs
3½ Digit Simple DMM	20 minutes	15 minutes	\$27 ↔	\$90 - \$130
4½ - 5½ Digit Moderate DMM	30 minutes	15 minutes	\$35 ↔	\$130 - \$230
5½ - 6½ Digit Complex DMM	50 minutes	15 minutes	\$52 ↔	\$240 - \$440

ACME's direct costs for DIY calibration vs. outside cal

Even better economies with automation!

Class of Instrument	Technician's Calibration Time	Administrator's Time	Internal Admin Time & Material Costs	Example Outside Costs
3½ Digit Simple DMM	20 minutes	15 minutes	\$27 ↔	\$90 - \$130
4½ - 5½ Digit Moderate DMM	30 minutes	15 minutes	\$35 ↔	\$130 - \$230
5½ - 6½ Digit Complex DMM	50 minutes	15 minutes	\$52 ↔	\$240 - \$440
Automated Cal For A Complex DMM	15 minutes	6 minutes	\$17 ↔	\$240 - \$440

Benefits of automated cal

- Reduced Calibration Time
results in a Reduced
Calibration Cost
 - obviously a key benefit
 - definitely it is not the only benefit
- Other Benefits
 - Consistency of calibrations
 - Quality of Processes & Documentation
 - Efficiency - Freeing Up Of Manpower Resources
- Automation opens the possibility of using existing lesser skilled persons, saving the higher skilled staff for more important work

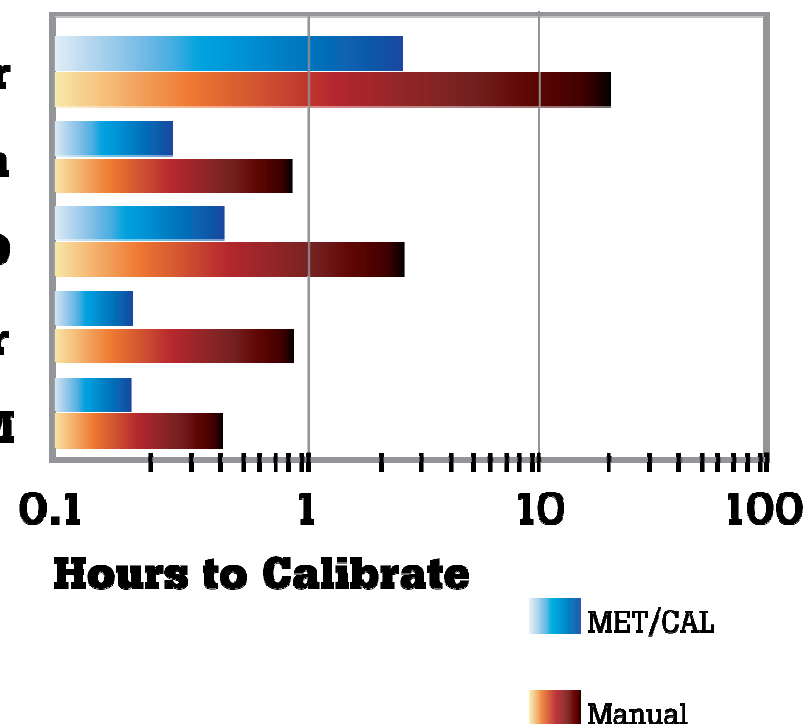
Spectrum Analyzer

Signal Gen

DSO

Bench Meter

HH DMM



Time comparison for manual & automated calibration methods

Class of Instrument	Number of Verification Tests	Technician Time		
		Manual with Only Pass/Fail Data	Manual with Verified Test Data	Automated w/ Verified Test Data
3½ Digit Simple (Fluke 79 III)	More than 35	20 minutes	35 minutes	20 minutes
4½ - 5½ Digit (Fluke 45)	More than 30	20 minutes	30 minutes	15 minutes
5½ - 6½ Digit (Agilent 34401)	More than 60	40 minutes	50 minutes	15 minutes

Lets summarize the value ACME receives through implementing DIY

- Presently ACME spends more than \$70K annually to calibrate just their DMMs.
- We saw there are several alternatives to improve & reduce this annual cost for calibration
 - DIY calibration using an automated system looks like the most attractive alternative
 - Alternatively, calibration contracts from outside suppliers offers a smaller improvement
- Additionally DIY offers better management of both quality & efficiency



Cost Of Ownership

**What are the costs associated with owning
calibration equipment?**

Our review of key financial points for DIY calibration includes:

1. Acquisition cost of new equipment
2. Operational costs for calibrating the workload
3. Maintaining traceability on calibrators
4. Annual depreciation expense



1. Calibrator acquisition costs

Cost depends on what is purchased -

- Match your both calibration workload & quality processes with these essential building blocks of DC/LF AC Metrology:
 - **Precision Sources**
 - **Precision Measurement**
 - **Selected Reference Standards**
- Remember to look to future needs and consider higher performance calibrators
 - **The calibrator's lifetime is long, when possible cover the improved future workload performance**
- The financial analysis often justifies investing in a complete system
 - **But it is possible to invest at a step at a time**
 - **the large workload of meters & dmms today with a calibrator & meter**
 - **then later into scopes**
 - **then standards for better quality control, etc.**

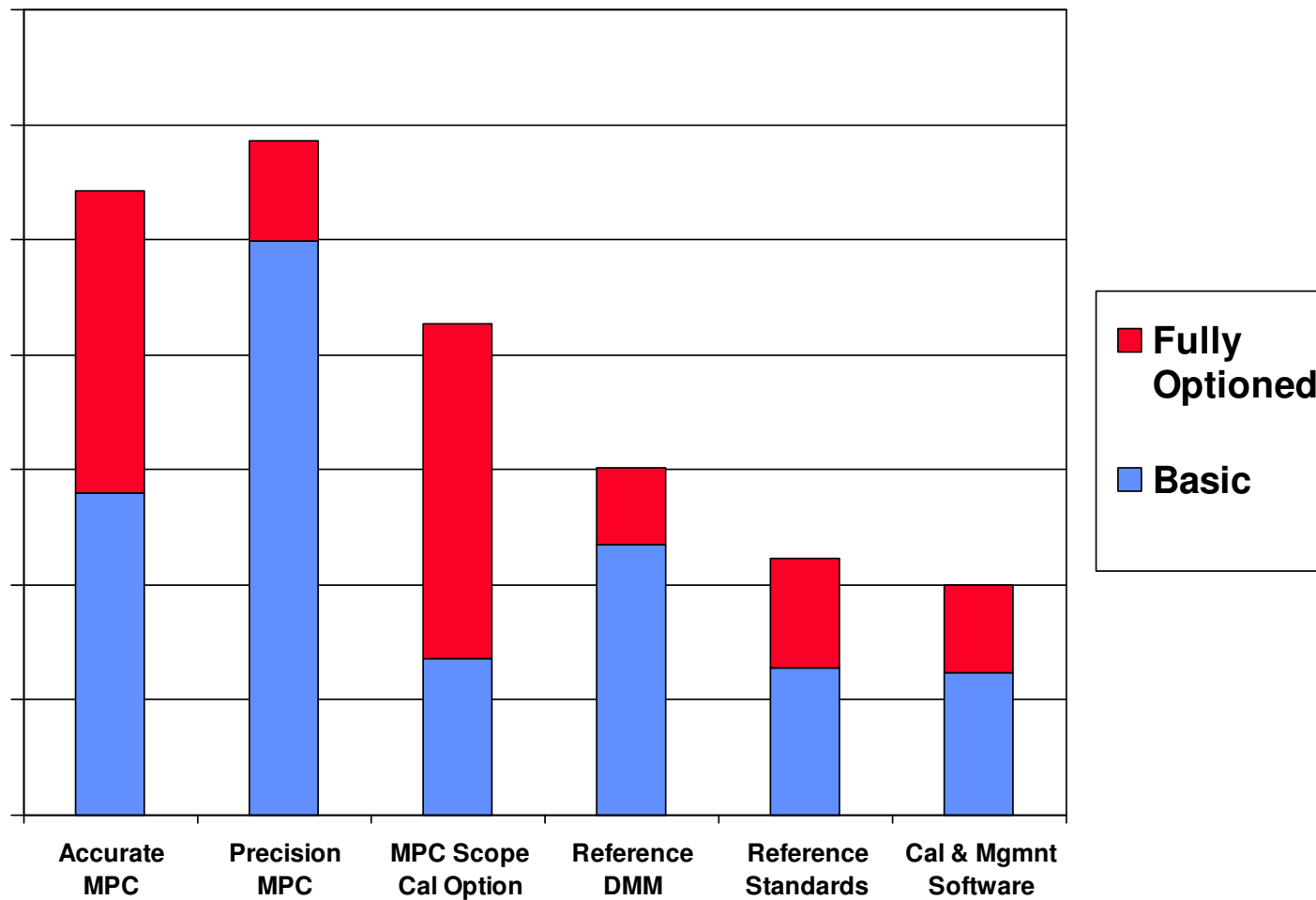
Typical instrumentation for DC/LF AC metrology

- Multi Product Calibrator (Precision Source)
 - The most common precision source which addresses a broad workload of UUTs, such as:

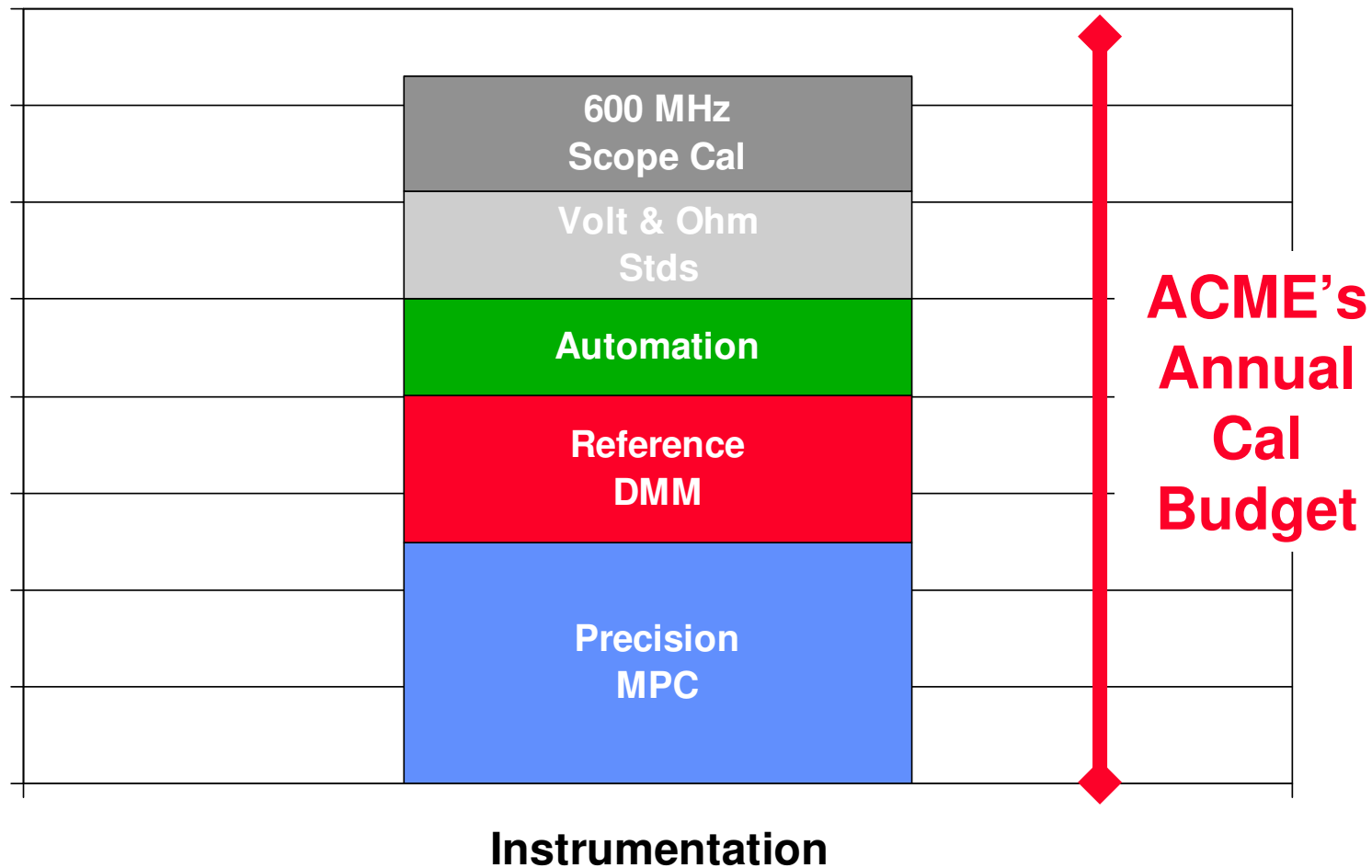
Handheld & bench multimeters	Oscilloscopes
Thermometers	Data Loggers
Power meters	Power Analyzers
Current Clamps	Chart Recorders
Panel Meters	Graphical Meters
 - Not just the simple & basic parameters of Volts, Amps and Ohms
 - Direct & Alternating Volts, Resistance, Direct & Alternating Current
 - Capacitance, Power, Phase, Thermocouple, RTD, Waveforms,
 - Leveled Sine wave, Time Marks, Edge & Risetime, Complex Scope Triggers
- Reference DMM (Precision Measurement)
 - The most common precision measurement device used for
 - Measurement based calibrations
 - Accuracy Enhancement & Ratio Comparisons
 - Measurement Assurance for precision sources/calibrators
- V & Ω Artifact Standards (Selected Reference Standards)
 - Use to Verify & Check a DMM's key measurement functions



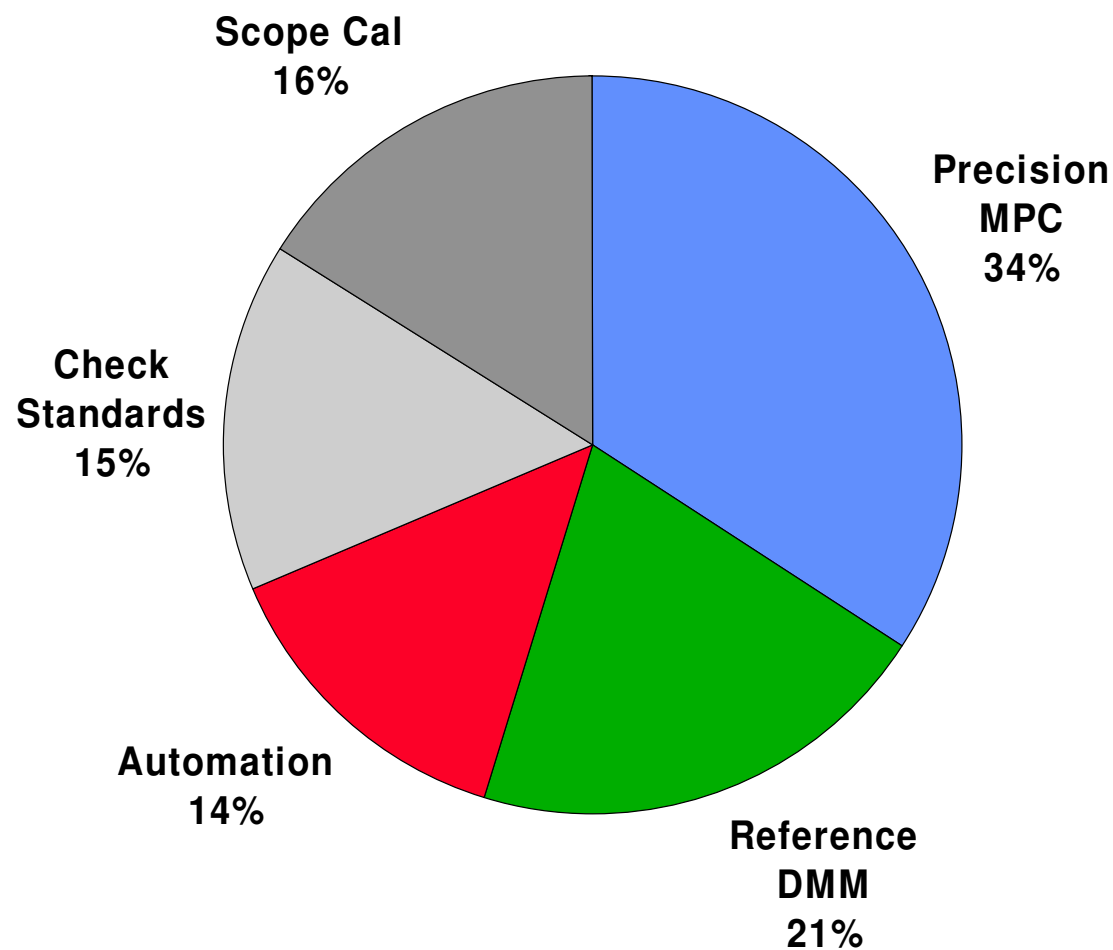
Purchase investment profile



A typical precision electrical cal system investment



Investment split by instrument category



2. ACME's operational costs

Estimated DIY Calibration Costs			
Class of Instrument	Manual with Only Pass/Fail Data	Manual with Verified Test Data	Automated with Verified Test Data
3½ Digit Simple	\$27	\$39	\$21
4½ - 5½ Digit Moderate	\$27	\$35	\$17
5½ - 6½ Digit Complex	\$44	\$52	\$17
Assumptions: Both moderate and complex dmms can be tested with fully automated techniques			

Comparison of annual operational costs

Estimated DIY Calibration Costs For Our Example Workload			
Class of Instrument	3 rd Party Calibration Provider	DIY Calibration, Manual Processes	DIY Calibration, with Automated Processes
100 units of 3½ Digit	\$9000	\$2650	\$2067
75 units of 4½ - 5½ Digit	\$17250	\$2625	\$1238
100 cals on 50 units of 5½ - 6½ Digit	\$44000	\$5167	\$1650
Total Annual Costs	\$70250	\$10442	\$4954

3. Annual maintenance costs

- Annual Cost For Accredited Calibrations (\$1700 to \$5300)
 - Precision MPC 5520A: \$1700
 - Reference DMM 8508A/01: \$1100
 - 10V, 1 Ω , 10 k Ω Reference Standards: \$1650
 - 600 MHz Scope Option on MPC: \$800 additional to basic calibration
- Contracted Calibration Reduces Annual Costs
 - Fluke offers a savings of approximately 20% over standard cal prices
- Repair Costs Cover Random Failures
 - Repair & recalibration charges can range between 10% to 20% of the purchase price
- Full Cal & Repair Support Program – a solution you can budget
 - One fixed fee for both annual calibration and repair requirements
 - Value priced, only moderately higher than the annual recalibration fees
- Software Maintenance Expenses – staying safe & current on a budget
 - A fixed annual fee of approximately \$3000 covers all software improvement upgrades, a library of warranted procedures, data recovery expenses, etc.

4. Depreciation expenses

- The Annual Depreciation Expense
 - **An annual expense carried on the books**
 - **Usually expensed over a 5 year period**
- In this example, 20% of the acquisition costs represent \$8,000 to \$14,000 – depending upon the initial purchase amount
- Calibrators are long lived... much longer than the depreciation period (7 years, 10 years, or more)
 - **The annual savings significantly increases during the extended useful life of the instrumentation**

ACME's DIY financial alternatives

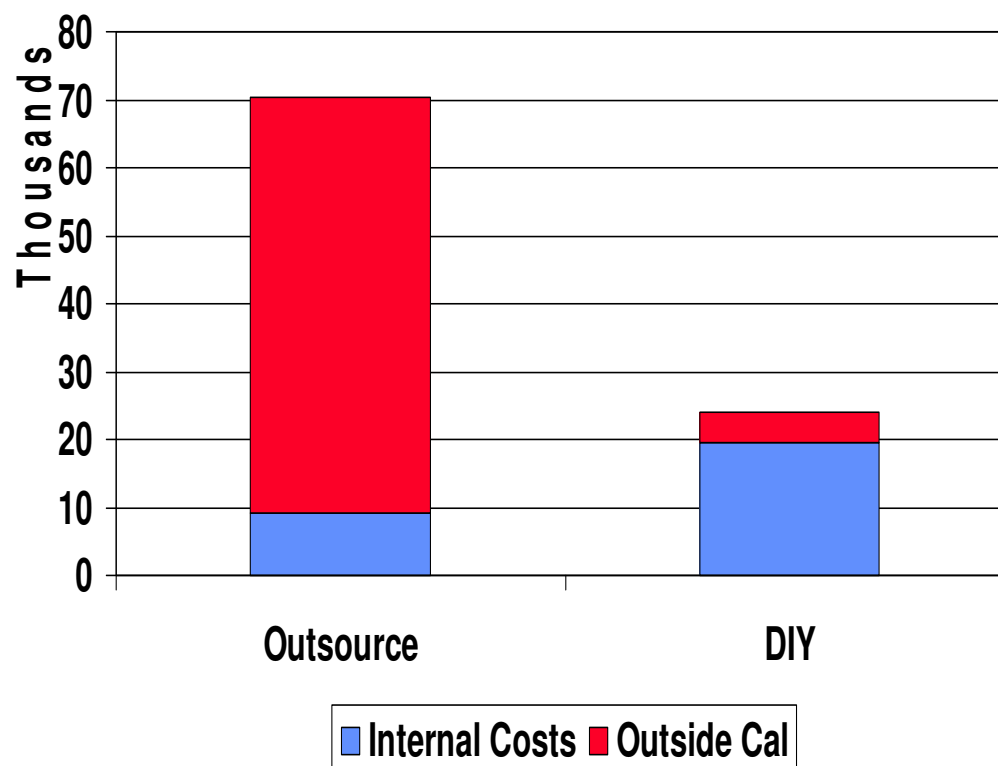
- Manual techniques
 - ACME's hardware solution requires a \$51,000 initial investment
 - Depreciation & calibration costs approximately \$14,700 annually
 - In house cal labor costs of approximately \$10,400 per year
 - Total Annual Cost is \$25,100 – initial annual savings of \$45,100
- Automated techniques
 - Their hardware/software solution requires a \$61,200 initial investment
 - Depreciation, calibration, & software maintenance costs approximately \$19,900 annually
 - In house cal labor costs approximately \$5,000 per year
 - Total Annual Cost is \$24,800 – initial annual savings of \$45,400

Financial details

- Equipment Utilization
 - Initial workload only utilizes the instruments at 5% (automated) to 11% (manual) of time capacity.
 - Still available is much more workload capacity with little to no additional capital investment
 - With such an available capacity, it is feasible to take on workload from other areas of the organization – which strengthens the justification even further!
- Payback In Years
 - Manual - 0.8 years
 - Automated - 0.97 years
- Derived Equipment Cost/Cal Hour
 - Manual - \$66/cal hour (222 man hours per year)
 - Automated - \$190/cal hour (105 man hours per year)
- Projected 5 year savings of \$315K for automated solution

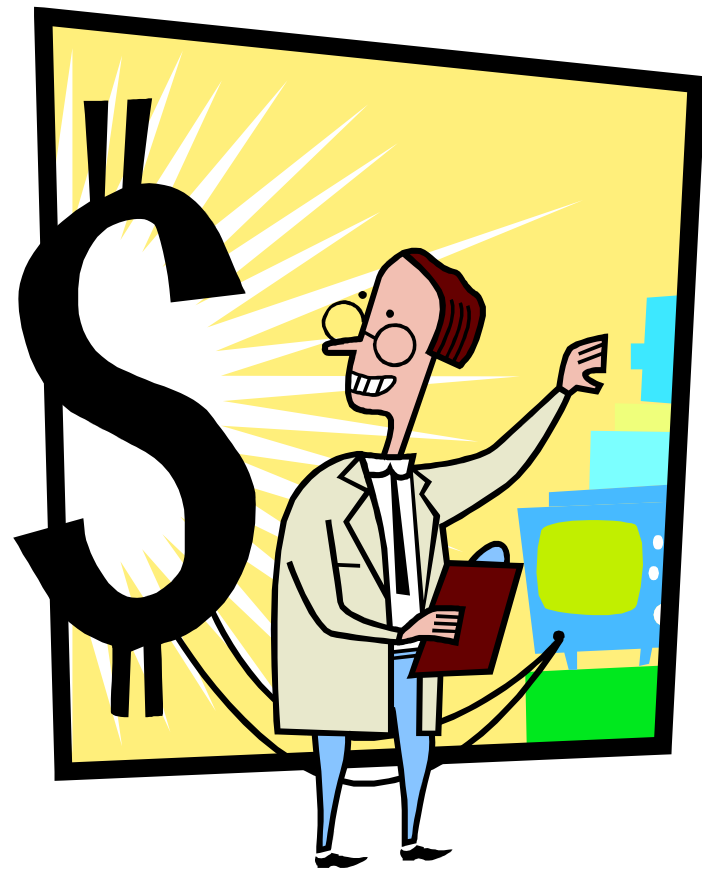
ACME's annual costs – Outsourcing vs. Automated DIY

- Outsourced Calibration
Provider costs total \$70K:
 - 3rd party provider receives \$61,000 for all instrumentation
 - Internal administrative costs of supporting the outside provider is \$9,250
- In House costs total \$24K:
 - In house costs increase to \$19,900 for DIY
 - 3rd party expenses reduce to \$4,500 for supporting calibrator traceability



ACME's financial summary for DIY calibration

- DIY is effective to reduce overall costs to calibrate test instrumentation
- ACME showed total improvement at the bottom line of \$45K after considering all financial details.
- Such expense reductions directly add to the bottom line profit in an operation



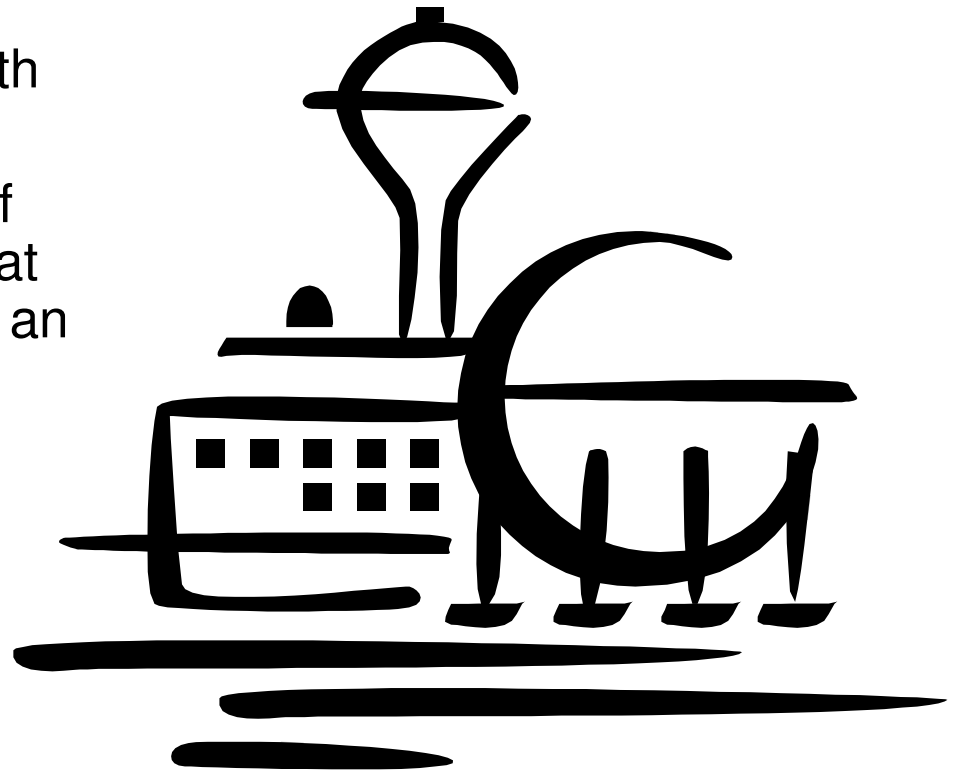
Example 2 – Replacing/upgrading an older calibrator to improve accuracy & workload coverage

We will study BETA Manufacturing Company, an established company with an active calibration lab.

BETA's workload includes a number of medium to high performance dmms that require calibrating more functions with an accuracy better than what is possible with their older/obsolete 5100B calibrator.

Higher performance instrumentation workload:

- 100 moderately accurate bench dmms calibrated yearly
- 75 more accurate system dmms calibrated yearly



BETA's problem

- The accuracy of their higher performance dmm's is better than what their existing calibrators can support.
- They are sending this workload out to commercial cal labs at what has become a significant cost in money and turn around time
- Can purchasing an improved calibrator be justified?



BETA's annual cost for an outside calibration service

Class of Instrument	Cost For Calibration	Items in Workload	Calibrations Per Year	Annual Cost
4½ - 5½ Digit Moderate DMM	\$120 (Traceable with Data)	100	1 (100 total)	\$12,000
5½-6½ Digit Complex DMM	\$220 (Traceable with Data)	75	1 (75 total)	\$16,500
Total		175	175	<u>\$28,500</u>

The alternative calibrator

UPGRADED NEW CAPABILITIES

- Multi Product Calibrator (Precision Source)
 - The most common precision source which addresses a broad workload of UUTs, such as:

Handheld & bench multimeters	Oscilloscopes
Thermometers	Data Loggers
Power meters	Power Analyzers
Current Clamps	Chart Recorders
Panel Meters	Graphical Meters
 - Not just the simple & basic parameters of Volts, Amps and Ohms
 - Direct & Alternating Volts, **Variable Resistance**,
 - Direct & Alternating Current
 - Capacitance, Power, Phase, Thermocouple, RTD, Waveforms,**
 - Leveled Sine wave, Time Marks, Edge & Risetime, Complex Scope Triggers**



BETA's direct costs for DIY calibration vs. outside cal

Class of Instrument	Technician's Calibration Time	Administrator's Time	Internal Admin Time & Material Costs	Example Outside Costs
4½ - 5½ Digit Moderate DMM	30 minutes	15 minutes	\$35 ↔	\$120
5½ - 6½ Digit Complex DMM	50 minutes	15 minutes	\$52 ↔	\$220

BETA's calibration operating cost alternatives

Estimated DIY Calibration Costs For Our Example Workload		
Class of Instrument	3 rd Party Calibration Provider	DIY Calibration, Manual Processes
100 units of 4½ - 5½ Digit	\$12,000	\$3,500
75 units of 5½ - 6½ Digit	\$16,500	\$3,875
Total Annual Costs	\$28,500	\$7,375

Today

Future

Detailed cost summary

- Calibrator acquisition costs
 - Upgraded MPC – A solution for a \$25,000 investment
- Operational Costs
 - DIY Cal Labor Costs - \$7,375/year
- Maintenance Costs
 - Annual Calibration – \$1,700/year
- Financial Costs
 - Depreciation – \$5,000/year



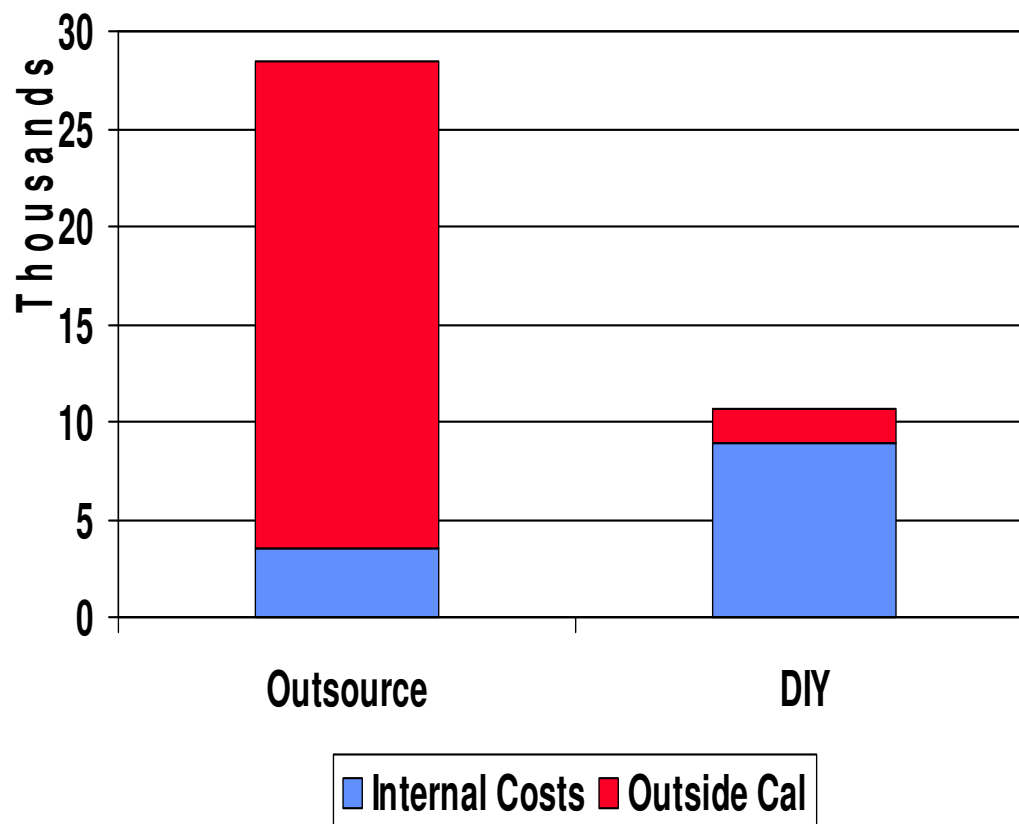
Beta's DIY financial justification

- Total Annual Cost - \$14,000
- Projected 5 year savings of \$101K vs. a \$25K purchase price
- Payback In Years
 - Manual – 1.24 years
- Derived Cost/Cal Hour
 - Manual - \$43/cal hour (156 man hours per year)
- If BETA's calibration was automated, then the financials are better
 - Projected 5 year savings – \$122K
 - Payback – 1.02 year



BETA's annual costs – Outsourcing vs. Automated DIY

- Outsourced Calibration
Provider costs total \$28.5K:
 - 3rd party provider receives \$25,000 for all instrumentation
 - Internal administrative costs of supporting the outside provider is \$3,500
- In House costs total \$10.6K:
 - 3rd party expenses reduce to \$1,700 for supporting calibrator traceability
 - In house costs increase to \$8,900 for DIY

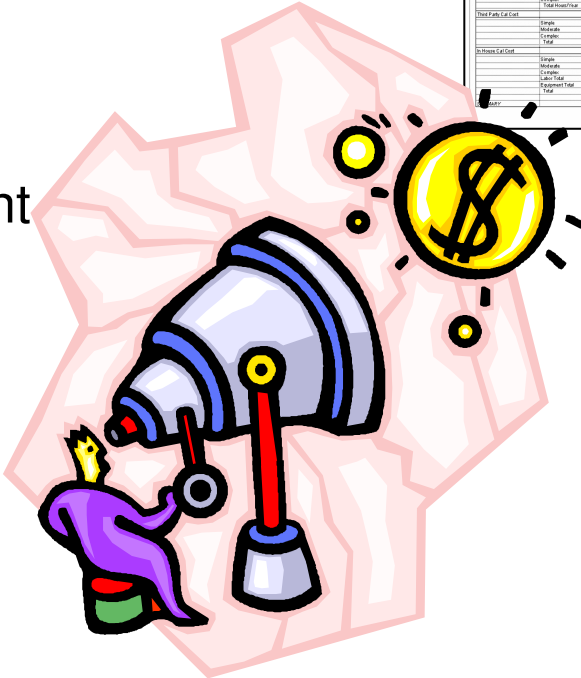


A Spreadsheet Tool

**There has to be an easier way to do all of these
calculations than by hand!**

Spreadsheets give a better picture of DIY calibration costs

- Do a full cost analysis with all the other factors besides the direct time and overhead costs for in house cal.
- Provides information such as annual payback for the investment & resources

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Factors included in the spreadsheet (1)

- Long Term factors – annual growth, inflation, etc.
- Labor and Burden Rates – different levels, yearly hours,
- Third party calibration service costs with 3 levels of complexity
- Average time to administer UUTs in house

ACME Electronics Company					
	Current Year		2006		
	Annual Co. Growth		8%		
	Annual Inflation		4%		
	Hours/Year		1980		
Labor and Burden Rates					
	Cal Tech Labor Rate		\$30.00		
	Administrative Labor Rate		\$20.00		
	Department Burden Rate		\$20.00		
Third Party Costs					
			3rd Pty. Cost	Admin. Time (hours)	Matl & Handling Costs
	Simple Handheld		\$60.00	0.50	\$10.00
	Moderate Bench		\$200.00	0.50	\$10.00
	Complex System		\$400.00	0.75	\$10.00

Factors included in the spreadsheet (2)

- Workload population & cal intervals
- Average time to cal UUTs in house
- Separate manual & automated cal time details

Calibration Workload Inventory		Units	Cals/Yr
	Simple	100	1
	Moderate	75	1
	Complex	50	2
Avg Time to Cal (In-House) - hours		Cal Time	Admin Time
Manual Calibration	Simple	0.33	0.25
	Moderate	0.50	0.25
	Complex	0.83	0.25
Automated Calibration	Simple	0.33	0.10
	Moderate	0.25	0.10
	Complex	0.25	0.10

Factors included in the spreadsheet (3)

- Calibration standard alternatives
- Additional automation elements
- Purchase costs
- Annual maintenance costs

Equipment		Possible Items		Selected Items	
	Instrument	Purchase Price	Annual Cal Price	Purchase Price	Annual Cal Price
source std	5520A	24,950.00	1,717.00	24,950.00	1,717.00
measurement std	8508A/01	15,110.00	1,109.00	15,110.00	1,109.00
check stds	10V 1Ω 10KΩ	11,120.00	1,637.00	11,120.00	1,637.00
scope cal	600 MHz opt	11,840.00	844.00		
	---	0.00	0.00		
	Hardware Total	63,020.00	5,307.00	51,180.00	4,463.00
	Added Cost For Automation				
Data Base System	MET/BASE-7	4,490.00		4,490.00	
Cal License	MET/CAL-L	3,370.00		3,370.00	
Interface & Cables	MET/CAL-IEEE PCI	2,160.00		2,160.00	
Annual Support Contract	MET/SUPPORT GOLD		3,150.00		3,150.00
	---	0.00	0.00		
	Automation Total	10,020.00	3,150.00	10,020.00	3,150.00
	Grand Total	73,040.00	8,457.00	61,200.00	7,613.00
Support for Calibration Standards					
	Cals/Year	1			

Spreadsheets Calculations & Conclusions

- Analyzes both third party costs & in house costs
- Considers 5 years into the future
- Calculates annual savings
- Payback is purchase cost vs. average annual savings

Calibration Instruments Support Cost					2006	2
	New Equip.	\$51,180				
	Annual Deprec.	20%			\$10,236	\$10,236
	Cals/Year	1				
	Cal + Support Cost	\$4,463			\$4,463	\$4,463
	Total Annual Cost				\$14,699	\$14,699
	Equipment Cost/Cal Hour				\$66	\$66
Calibration Workload Inventory		Cals/Yr			2006	2
	Simple	1			100	
	Moderate	1			75	
	Complex	2			50	
Avg Time to Cal (In-House)		Cal	Admin		2006	2
Manual Calibration	Simple	0.33	0.25		58.00	62
	Moderate	0.50	0.25		56.25	60
	Complex	0.83	0.25		108.33	117
	Total Hours/Year				222.58	240
Third Party Cal Cost					2006	2
	Simple				\$9,000	\$10,236
	Moderate				\$17,250	\$19,236
	Complex				\$44,000	\$49,236
	Total				\$70,250	\$78,708
In House Cal Cost			cost/cal		2006	2
	Simple		\$27		\$2,650	\$2,650
	Moderate		\$35		\$2,625	\$2,625
	Complex		\$52		\$5,167	\$5,167
	Labor Total				\$10,442	\$11,442
	Equipment Total				\$14,699	\$14,699
	Total				\$25,141	\$26,141

SUMMARY							
		2006	2007	2008	2009	2010	5-Years
Savings or (Deficit)		\$45,109	\$52,299	\$60,390	\$69,492	\$79,733	\$307,023
Equipment Utilization		11%	12%	13%	14%	15%	
Payback in Years	0.83						

The “FORM”


How do you relate the facts to your capital approval process?

The formal justification

Identifies & Documents the key facts needed for a decision

Fluke's "The Capital Appropriation Request" form is used -

- For Purchases > \$2500
- With Lifetimes > 3 Years
- Understand what your business's CAR limits are



Company : FLUKE CORPORATION		CAR #:	
CAPITAL APPROPRIATIONS REQUEST (3 page form) Rev Date: 07/2004			
PROJECT NAME:			
PROJECT DESCRIPTION:			
PROJECT CATEGORY:		CAPITAL BUDGET STATUS:	
<input type="checkbox"/> Capacity/Expansion <input type="checkbox"/> Replacement <input type="checkbox"/> Profit Improvement <input type="checkbox"/> New Product Line/Market <input type="checkbox"/> Other:		Budgeted? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Budgeted Year: _____ Budgeted Amount: _____ Description: _____	
BUSINESS RATIONALE:			
FINANCIAL JUSTIFICATION:			
FINANCIAL ANALYSIS:			
Investment :	Total	Project 1st	Quarter 3rd 4th
Purchased Amount	\$ 0		
Installation Cost	\$ 0		
Other	\$ 0		
Total Capital	\$ 0	0	0 0
Return on Capital :	Pre-Tax S		(Show Calculations)
	Pre-Tax		
APPROVALS:			
Desires for Final Approval:			
Title :		Signature :	Date :
Project Mgr/Leader			
Financial Manager			
Department Mgr			
Vice President - Group			
Vice President / Finance (< \$75k)	Jay Suel		
President / DHR Group Exec (< \$500k)	Jim Lico		
Danaher Exec Vice President (< \$1M)	Steve Simms		
Danaher Corp. Officer (> \$1M)	Larry Culp		

Provides answers to the important questions

1. Project Description – What it is
2. Project Category – **Why** it is being done
3. Budget – Is it budgeted?
4. Business Rationale – **Why** it makes good business sense
5. Financial Justification – **Why** it is financially beneficial
6. Financial Analysis – **Why** it is financially sound

Company : FLUKE CORPORATION		CAR #:			
CAPITAL APPROPRIATIONS REQUEST (3 page form)					
PROJECT NAME:		Rev Date: 07/2004			
PROJECT DESCRIPTION:					
PROJECT CATEGORY:					
		Capacity/Expansion			
		Replacement			
		Profit Improvement			
		New Product Line/Market			
		Other:			
BUSINESS RATIONALE					
FINANCIAL JUSTIFICATION:					
FINANCIAL ANALYSIS:					
Investment :	Total	Projected Spending by Quarter			
		1st	2nd	3rd	4th
Purchased Amount	\$ 0				
Installation Cost	\$ 0				
Other	\$ 0				
Total Capital	\$ 0	0	0	0	0
Return on Capital :	Pre-Tax Savings per Year				
	Pre-Tax Payback in Years				
	(Show Calculations)				
APPROVALS:					
Title :		Desired Date for Final Approval:			
Name :		Signature :		Date :	
Project Mgr/Leader					
Financial Manager					
Department Mgr					
Vice President - Group					
Vice President / Finance (≤ \$75k)		Jay Suel			
President / DHR Group Exec (≤ \$500k)		Jim Lico			
Danaher Exec Vice President (≤ \$1M)		Steve Simms			
Danaher Corp. Officer (≥ \$1M)		Larry Culp			

Business rationale

Examples

- “Our calibration support costs for production test instrumentation will be reduced by more than 50% by calibrating the instrumentation in our lab rather than using outside calibration services.”
- “Replacing our existing calibrators with more reliable, accurate, capable and automatable units will reduce our operating costs, calibration times/costs by 20%, and extend the life of our existing capabilities by at least 5 more years.”

Remember - learn what has worked for others in your organization!



Financial justification

This is the “executive summary” of your request

- Why the proposal is important
- A summary statement of the financial benefits
- Examples -
 - **“The additional capabilities provided with this calibrator will reduce expenses by \$46,000 or more per year by reducing for outside calibration service provider costs.”**
 - **“Automating the meter calibration station will reduce costs associated with technician and administrative times more than 50% per calibration. This saves \$5500 per year.”**

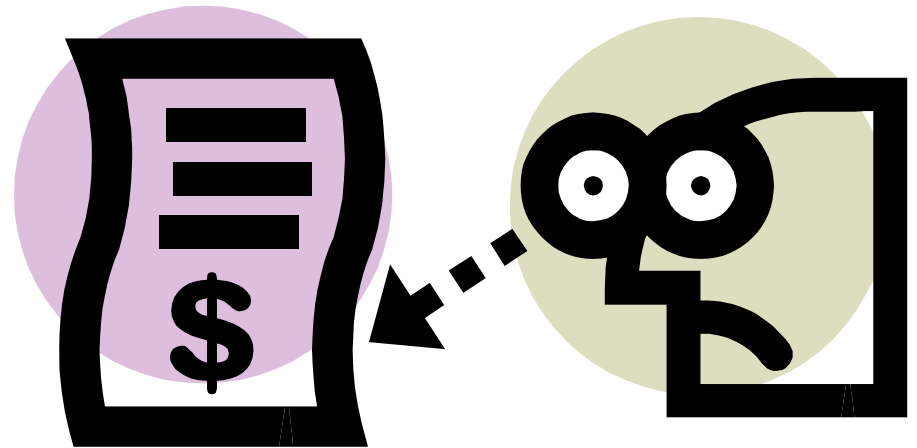


Financial analysis

- It is a detailed analysis measuring the financial factors
- Includes summary metrics– “The Bottom Line”
 - **Pre-Tax Savings per year**
 - **Pre-Tax Payback in years**

Recommendations on measuring the financial factors -

- Understand what you are doing today
- Have a through analysis of what the new situation will be.



Now ACME's management approval problem is solved!

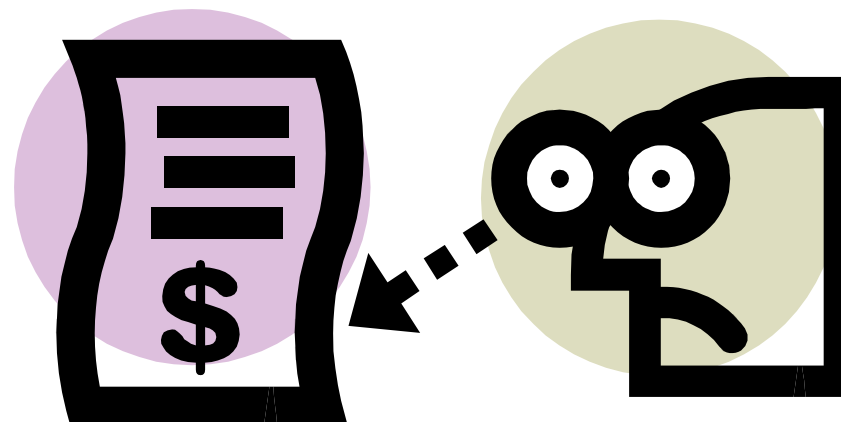
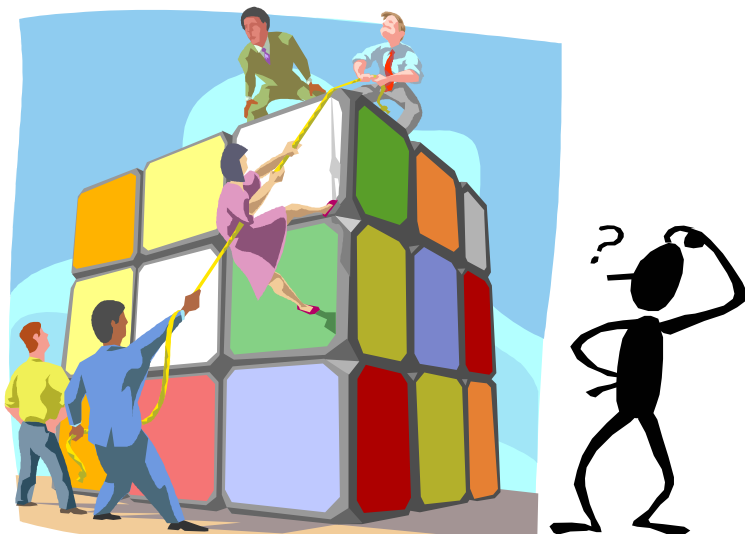


- **Describing what to do and WHY is it important?**
 - Improve quality and save costs on calibrating test instruments through doing calibrations internally
- **Knowing what is done today & WHY your solution is better?**
 - \$70K of annual expenses are reduced to \$24K
- **Understanding WHY this solution is better than the alternatives?**
 - Other providers and contract arrangements can reduce by 10% to 20%, versus the 67% reduction seen with the DIY solution
- **Knowing WHY & how is it financially better for the company?**
 - The financials on savings are detailed in the spread sheet analysis & are strong
- **Understanding WHY it fits with your ways of doing business?**
 - In a Fluke scenario, it meets the DBS philosophy with improvements in Quality, Delivery, Cost & Innovation

Conclusion & Review – What have we done?

- Topics
 - **Management perspective of justification**
 - **Costs associated with calibration**
 - **Cost of ownership of calibration equipment**
 - **Spreadsheet tool & acquisition form**
- Example – Analyzed ACME Electronics Co.'s & BETA Mfg. Co.'s needs
- Value – Realized a dramatic expense reduction and fast investment payback for a DIY calibration approach
- Tools – Spreadsheet Calculation Tool to support the financial facts
- Benefit – These tools make the metrologist's job easier when it comes to justifying calibration to management

Questions?



Cost Comparison Spreadsheet											
In-house vs. Third Party Calibration											
1	Current Year	2005									
2	Annual Co. Growth	0%									
3	Annual Inflation	4%									
4	Hours/Year	1900									
5											
6											
7											
8	Labor Rate	\$30.00									
9	Burden Rate	\$20.00									
10	Admin Rate	\$20.00									
11											
12											
13											
14	Third Party Costs										
15	Cost										
16	Single Handheld	\$40.00	0.50	\$10.00	\$60.00						
17	Moderate Bench	\$200.00	0.50	\$10.00	\$220.00						
18	Complex System	\$400.00	0.75	\$10.00	\$480.00						
19											
20	Equipment										
21											
22	New Equip. (5500A)	\$23,900									
23	Annual Deprec.	20%									
24	Cal/Year	1									
25	Cal Cost	\$1,500									
26	Total Annual Cost	\$6,280									
27	Cost/Cal Hour	\$3.25									
28											
29											
30											
31	Inventory										
32	Simple	1	100	100	100	100	100	100	100	100	100
33	Moderate	1	75	81	87	94	102	104	104	104	104
34	Complex	2	50	54	59	63	67	71	75	79	83
35	Avg Time to Cal (In-House)										
36	Simple	0.40	0.25	65.00	70.20	75.82	81.88	88.43			
37	Moderate	0.75	0.25	76.00	81.00	87.48	94.48	102.04			
38	Complex	1.25	0.25	100.00	102.00	104.00	106.00	108.00	110.00	112.00	114.00
39	Total Hours/Year			290.00	313.20	338.26	365.32	394.54			
40											
41											
42	Third Party Cal Cost										
43	Simple	\$5,000		\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
44	Moderate	\$17,500		\$35,000	\$35,000	\$35,000	\$35,000	\$35,000	\$35,000	\$35,000	\$35,000
45	Complex	\$44,000		\$88,000	\$88,000	\$88,000	\$88,000	\$88,000	\$88,000	\$88,000	\$88,000
46	Total	\$66,500		\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000
47											
48											
49	5500A Cal Cost (In-House)										
50											



For more information -

- Download your copy of the financial justification slides and spreadsheet

www.fluke.com/justify

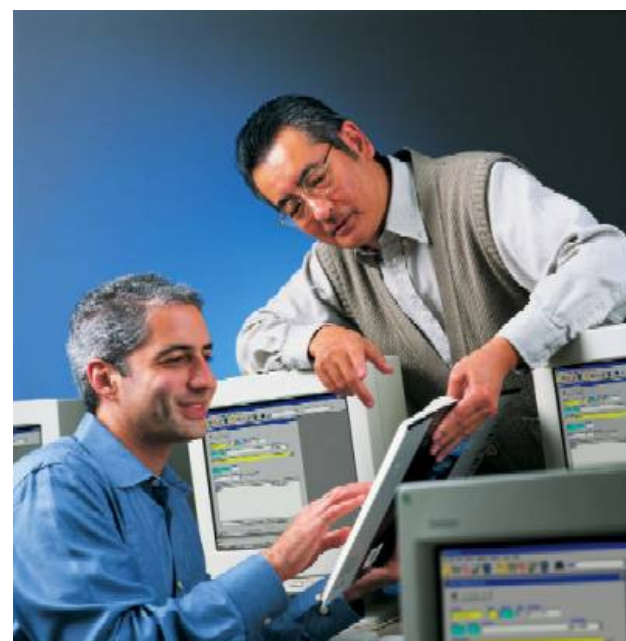
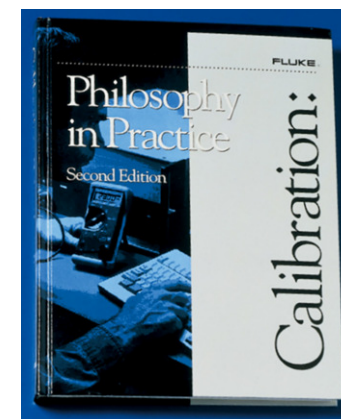
- Fluke's Training Course – Cal Lab Management for the 21st Century

- Section 6 on Laboratory Management in the text book ***Calibration: Philosophy in Practice***

- Various reference material at Fluke's web site:

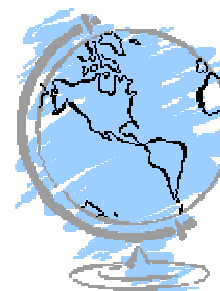
www.fluke.com

Cal Lab Management for the 21st Century		Cal Lab Management for the 21st Century	
Category	Value	Category	Value
Equipment	10000	Personnel	10000
Software	5000	Travel	5000
Materials	2000	Utilities	2000
Supplies	1000	Insurance	1000
Other	500	Other	500
Total	18500	Total	18500



Calibration and metrology training from Fluke

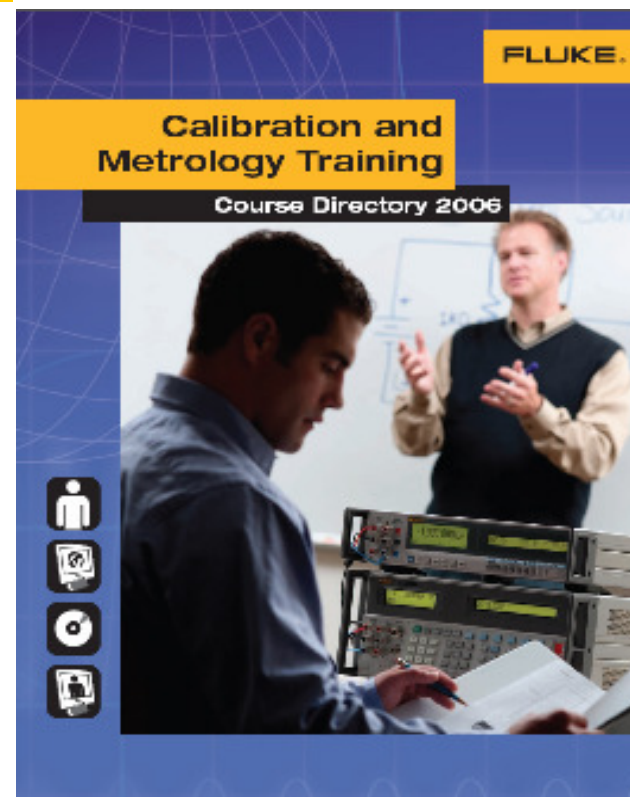
- Fluke calibration and metrology training helps you get the most from your investment in calibration instruments and software
- Multiple ways to learn:
 - **Instructor-led classroom sessions**
 - **Instructor-led web-based courses**
 - **Self-paced web-based training**
 - **Self-paced CD-ROM training**
- Multiple locations
 - **United States and Canada**
 - **Europe**
 - **Singapore**



Members of the MET/SUPPORT Gold and Priority Gold CarePlan support programs receive a 20 % discount off any Fluke calibration training course

Calibration and metrology training

- **Instructor-Led Classroom Training**
 - **MET-101 Basic Hands-on Metrology** (new in 2007)
 - **MET-301 Advanced Hands-on Metrology** (new in 2007)
 - Cal Lab Management for the 21st Century
 - Metrology for Cal Lab Personnel (A CCT prep course)
 - MET/CAL Database and Reports
 - MET/CAL Procedure Writing
 - MET/CAL Advanced Programming Techniques
 - On-Site Training
 - Product Specific Training
- **Instructor-Led Web-Based Training**
 - MET/CAL Database Web-Based Training
 - MET/CAL Procedure Development Web-Based Training
- **Self-Paced Web-Based Training**
 - Introduction to Measurement and Calibration
 - Precision Electrical Measurement
 - Measurement Uncertainty
 - AC/DC Calibration and Metrology
 - Metrology for Cal Lab Personnel (A CCT prep course)
- **Self-Paced Training Tools**
 - MET/CAL-CBT7 Computer Based Training
 - **MET/CAL-CBT/PW Computer-Based Training** (new in 2007)
 - Cal-Book: Philosophy in Practice textbook



More information:
www.fluke.com/2008caltraining

THANK YOU !

For material related to this session, visit our web site:

<http://www.fluke.com/justify>

For any questions email me at:

jack.somppi@fluke.com