



CONSOLIDATION TRENDS IN THE CMP CONSUMABLE SUPPLY BASE

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OUTLINE

1. Overview of Linx Consulting
2. Concentration in CMP Consumables
3. Comparison – CMP and Lithography
4. Current Market for M&A
5. Conclusions
6. Questions

NOTE: All data has been sourced from the following Linx Consulting reports:

1. *CMP Markets and Technologies to the 32nm Node*
2. *Advanced Patterning, 2007 to 2012*



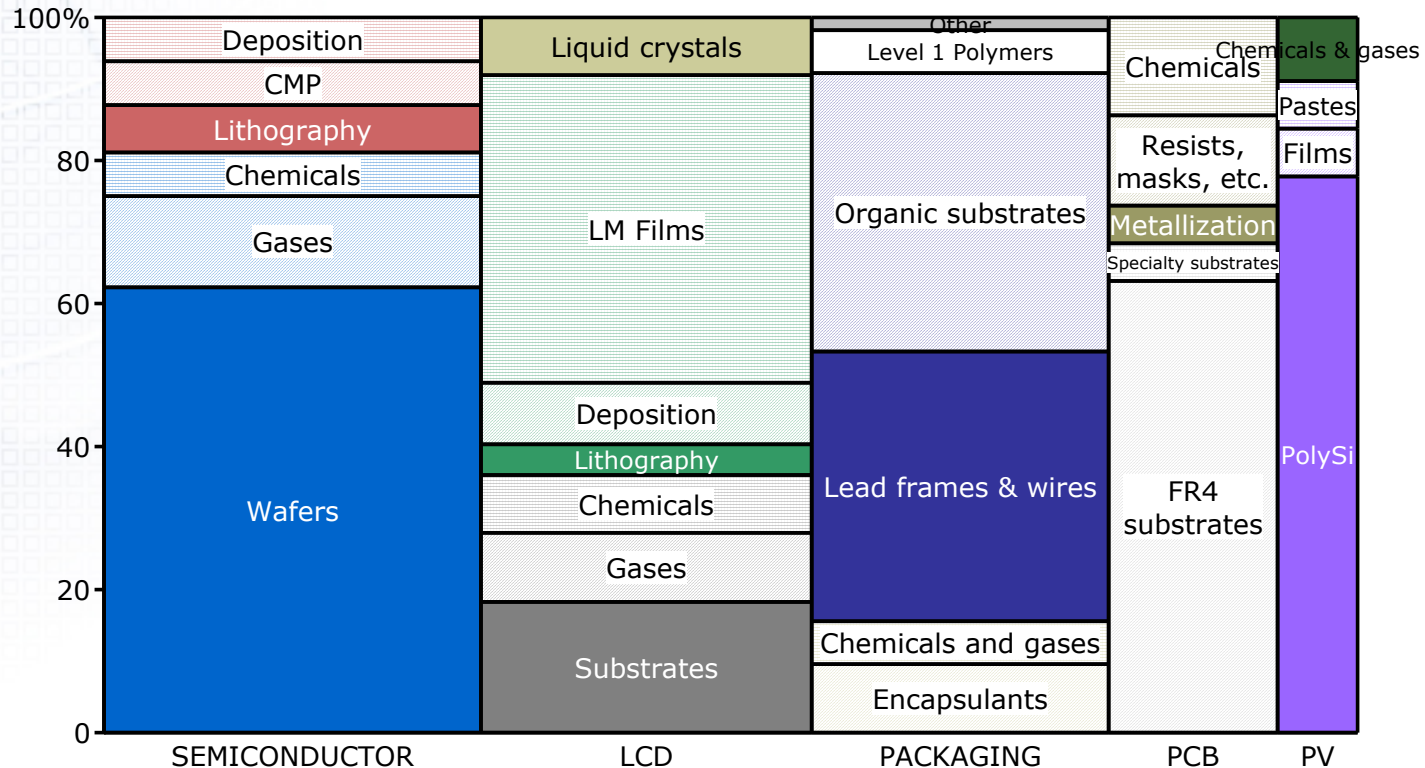
OVERVIEW OF LINX CONSULTING



DETAILED EM INDUSTRY KNOWLEDGE

2007 MARKET ESTIMATES, \$B

% TOTAL SEGMENT



Semi includes compound

% TOTAL ELECTRONIC CHEMICALS

Source: Linx Consulting



THE VALUE WE BRING TO CLIENTS

1. *We create knowledge and develop unique insights at the intersection of advanced thin film processes and the chemicals industry*

2. *We help our clients to succeed through our:*
 - Experience in global electronics and advanced materials and thin film processing industries:
 - Semi
 - LCD
 - Packaging
 - PV
 - Nano Technology
 - Other
 - Experience in the global chemicals industry
 - Global network and capabilities
 - Advanced modeling capabilities



WE PROVIDE HIGH CONFIDENCE DECISION SUPPORT SERVICES – SINGLE CLIENT





ANALYSIS REPORTS - SERVICES OFFERED

CURRENTLY AVAILABLE INDUSTRY ANALYSIS REPORTS

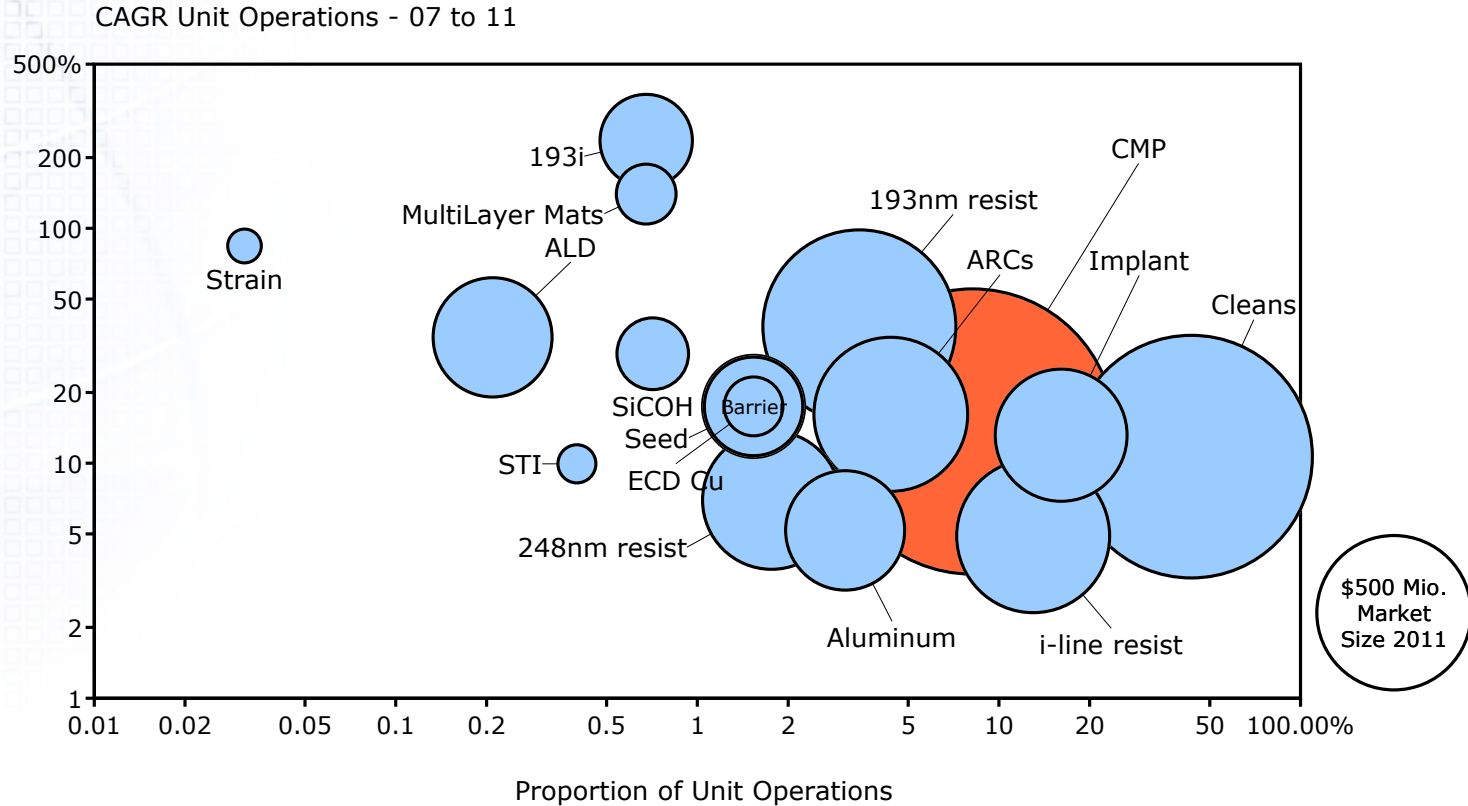
1. CMP Technologies and Markets to the 32 nm Node
2. Advanced Thin Films for FEOL and BEOL Applications
3. Advanced Materials and Chemicals for Photovoltaic Cells and Modules
4. Emerging Materials Opportunities for Advanced Semiconductor Devices
5. Advanced Cleaning and Surface Preparation: Technologies and Markets
6. Opportunities in Imprint Lithography
7. Specialty Abrasives in CMP
8. Advanced Patterning
9. Semiconductor Industry Direct Consumables Model



CONCENTRATION IN CMP CONSUMABLES



WHY LOOK AT CONSOLIDATION IN CMP?



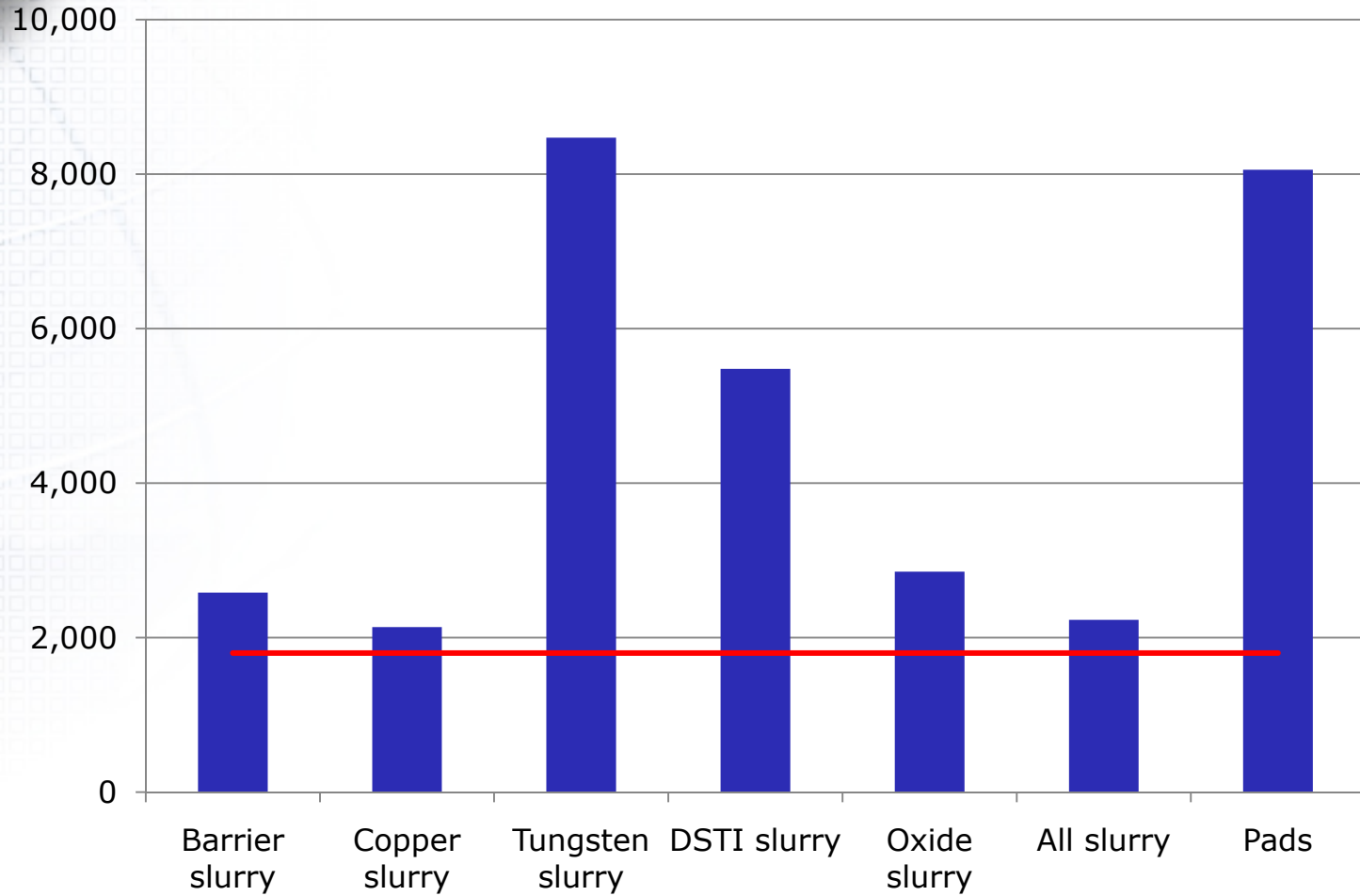


HERFINDAHL INDEX

- The Herfindahl Index is used to measure the degree of concentration in a market
- The HI is calculated as the sum of squares of share of all market participants
 - $HI = S_1^2 + S_2^2 + \dots S_N^2$
- The HI is a maximum of 10,000 for a market with one supplier with 100% share
- The lower the HI the more competitors with relatively equal market share
- DOJ/FTC perspectives:
 - HI values < 1,000 – market considered to be unconcentrated
 - HI values between 1,000 and 1,800 are considered to be moderately concentrated
 - HI > 1,800 – markets are considered to be concentrated

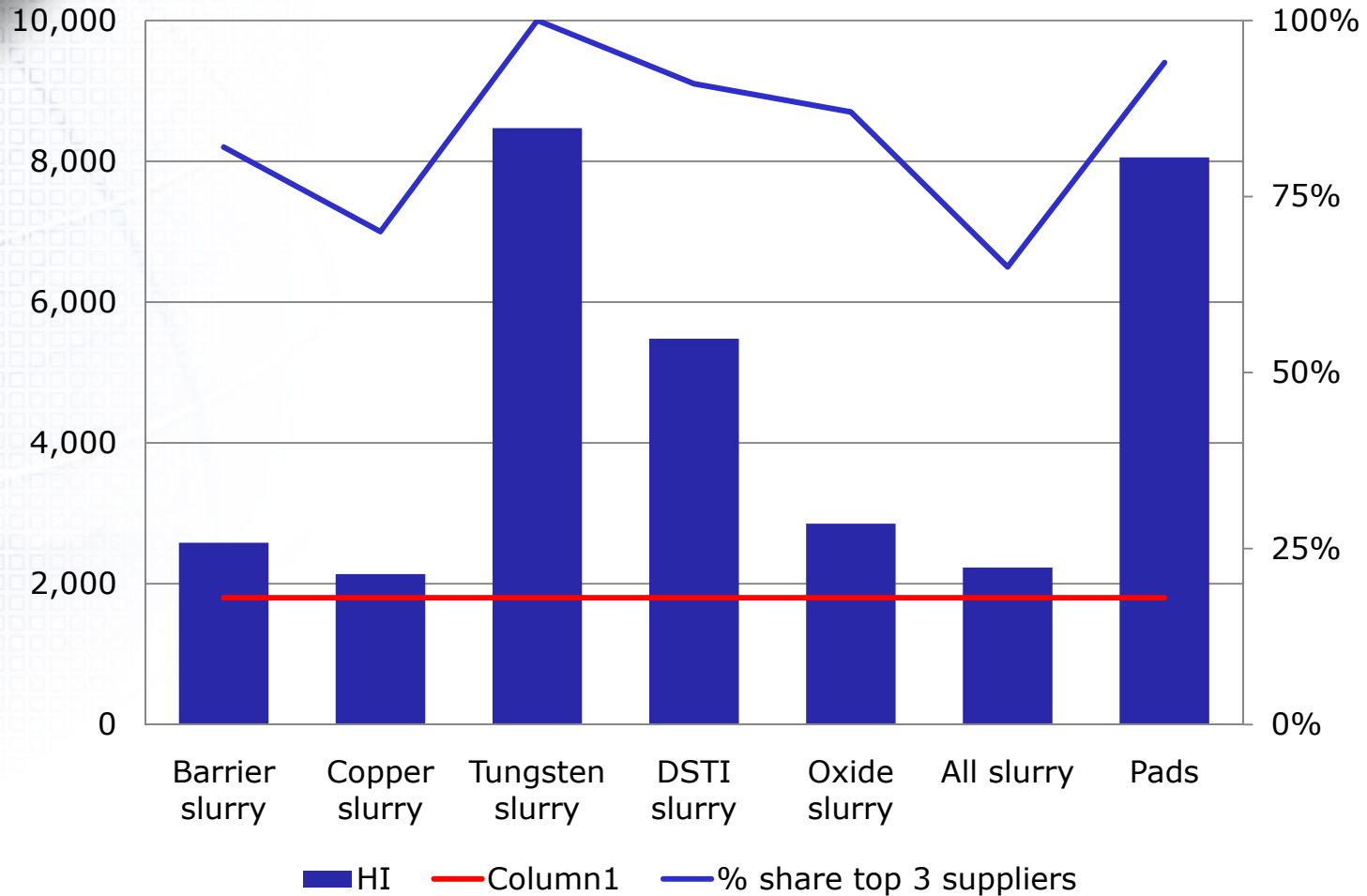


HERFINDAHL INDICES BY MARKET





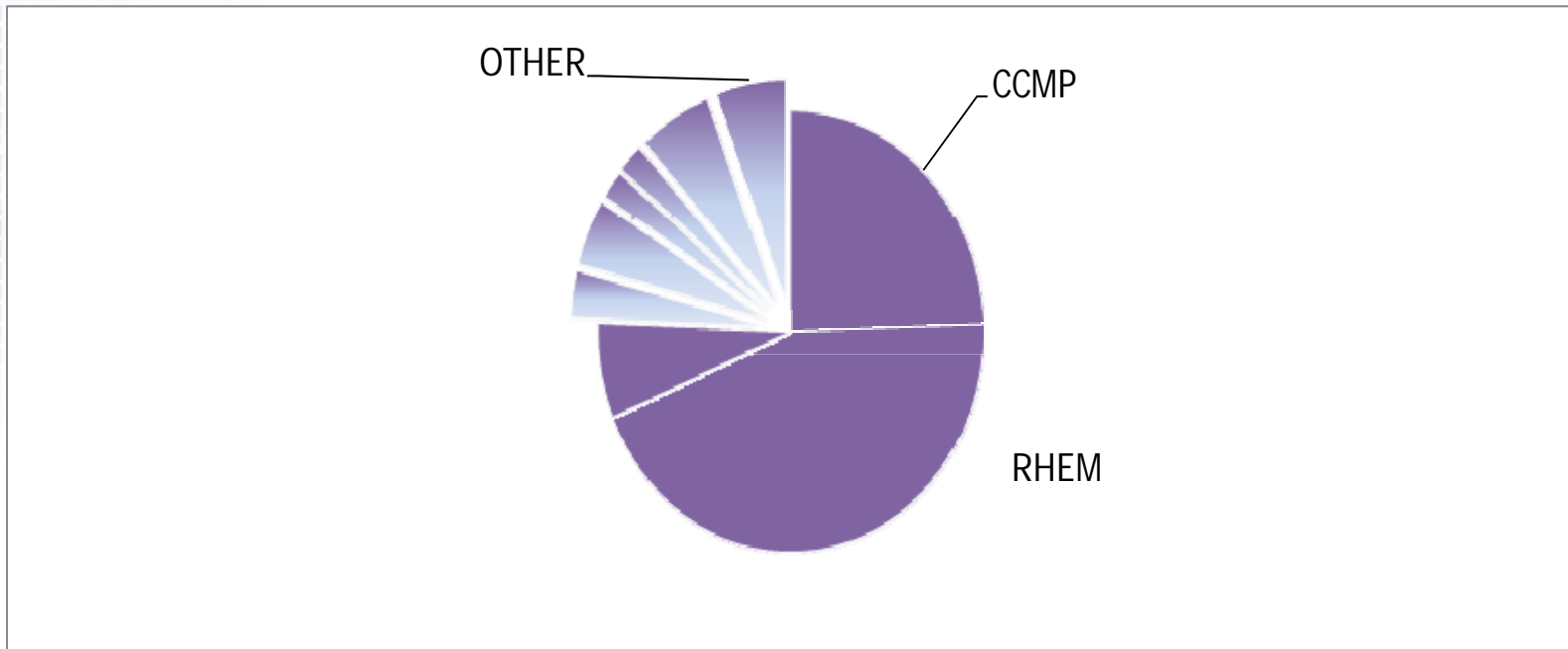
HERFINDAHL INDICES & TOP 3 SUPPLIER SHARES





WHY CONSOLIDATE? THERE ARE NOT TOO MANY SUPPLIERS

- Market is also considered to be concentrated
 - The top 3 suppliers have ~ 75% of the total pad and slurry market
 - The top 8 suppliers have ~95% of the market
 - The bottom 15 suppliers have ~5% of the market
- Leading suppliers of slurries and pads in 2007 are illustrated below:





WHY CONSOLIDATE? STRENGTH OF EXISTING & NEW PARTICIPANTS

COMPANY	KEY MARKET(S)	PARENT /CONSIDERATIONS
Rohm and Haas	<ol style="list-style-type: none">1. Leading pad producer2. Has a position at all end-users	Parent is highly focused in all segments of electronic materials
Cabot Micro	<ol style="list-style-type: none">1. Leading slurry supplier2. Has been successful with new pad	Strategically focused in CMP
Hitachi	<ol style="list-style-type: none">1. Leader in STI2. Well positioned in Korea	Parent is \$6 billion company
JSR	<ol style="list-style-type: none">1. Leader in photoresists	Parent is highly focused in all segments of electronic materials
Fujimi	<ol style="list-style-type: none">1. Leader in wafer polishing	Scale from wafer polishing activities. Preferred position in abrasives
DA Nano	<ol style="list-style-type: none">1. Strength in advanced copper processes in logic2. Integrated in abrasives	Parents are highly focused on electronic materials
Planar Solutions	<ol style="list-style-type: none">1. Leading position in barrier	FFEM is investing in electronics. Wacker is making \$\$ in polysilicon
Asahi Glass Chemicals	<ol style="list-style-type: none">1. Leading position in DSTI for advanced nodes ($\leq 45\text{nm}$)	Parent is \$10 billion company



WHY CONSOLIDATE? FINANCIALS ARE STRONG

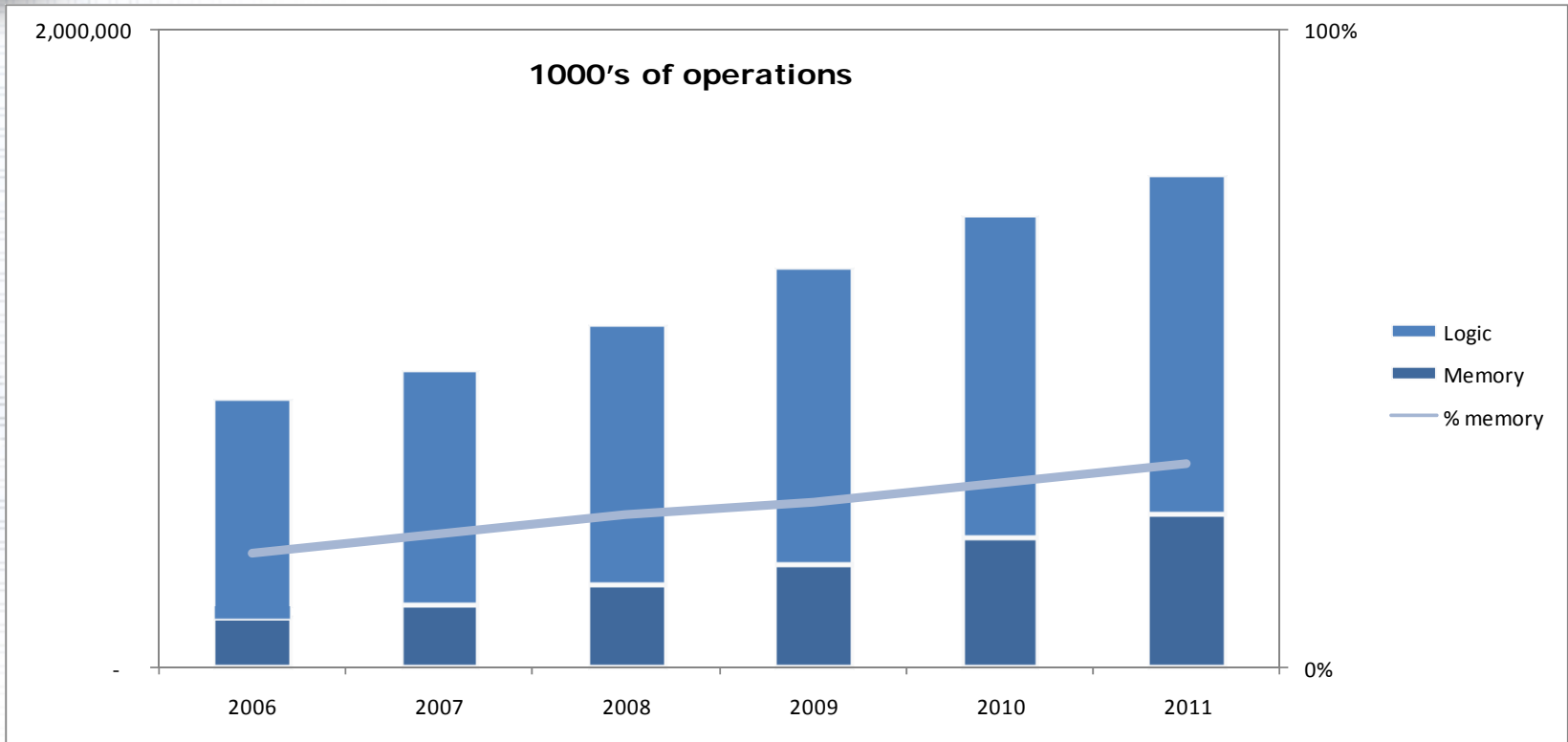
- Industry financial performance remains strong
- Reference 2007 annual report of Cabot Microelectronics:

	CCMP %, 2007	Estimated Industry Totals (\$ Million)
Revenue	100.0%	1,200
COGS	52.7%	650
Gross profit	47.3%	584
Operating expenses		
R&D	14.8%	182
SGA	19.0%	234
Operating Income	13.5%	167

- ROE > 10%



WHY CONSOLIDATE? THE INDUSTRY IS NOT MATURING





WHY CONSOLIDATE?

NEW ENTRANTS COMPETE ON TECHNOLOGY

Slurries

- On the slurry side, we are seeing several new entrants looking to compete based on technology:
 - BASF
 - ATMI and Anji Micro (dispense systems)
- Cost based suppliers can come from integrated particle positions or from wafer polishing. To date, there is little evidence of success of this strategy. This will likely hold true as supplier requirements increase down the roadmap

Pads

- On the pad side, we are seeing both new technology and me-too products:
 - New technologies:
 - 3M – Fixed abrasive
 - JSR and Innopad – water soluble components
 - Neopad and Semiquest – variations in surface hardness and COF
 - CCMP – Thermoplastic with continuous manufacturing process
 - Me- too products are usually encouraged by leading end-users to put pressure on Rohm and Haas. Suppliers in this category include:
 - SKC
 - IVT
 - KPC
 - Fujibo seems to have improved upon soft pad designs and will be implemented at 45 nm



WHY CONSOLIDATE? BUYER & TOOLS ARE CONSOLIDATING

BUYERS

- Fewer companies developing 32nm platforms
 - Samsung
 - Hynix
 - TSMC
 - UMC
 - Elpida/Rexchip/PSC
 - Qimonda/NTC/Inotera
 - Intel (and Micron)
 - IBM and partners
 - Toshiba/NEC
- More power to consortia
- However, there are many different variations on interconnect and FEOL processing

TOOL PRODUCERS

- Applied Materials and Ebara are only major tool suppliers remaining
- Ebara is gaining ground on high throughput copper tools
- Tool producers still have major impact on BKM, which becomes increasingly important as end-users are increasingly tied up in other activities, including:
 - Memory transitioning to copper and end-users have bigger integration challenges
 - New FEOL challenges including HKGD, strain and non-planar structures
 - Investigation of new materials

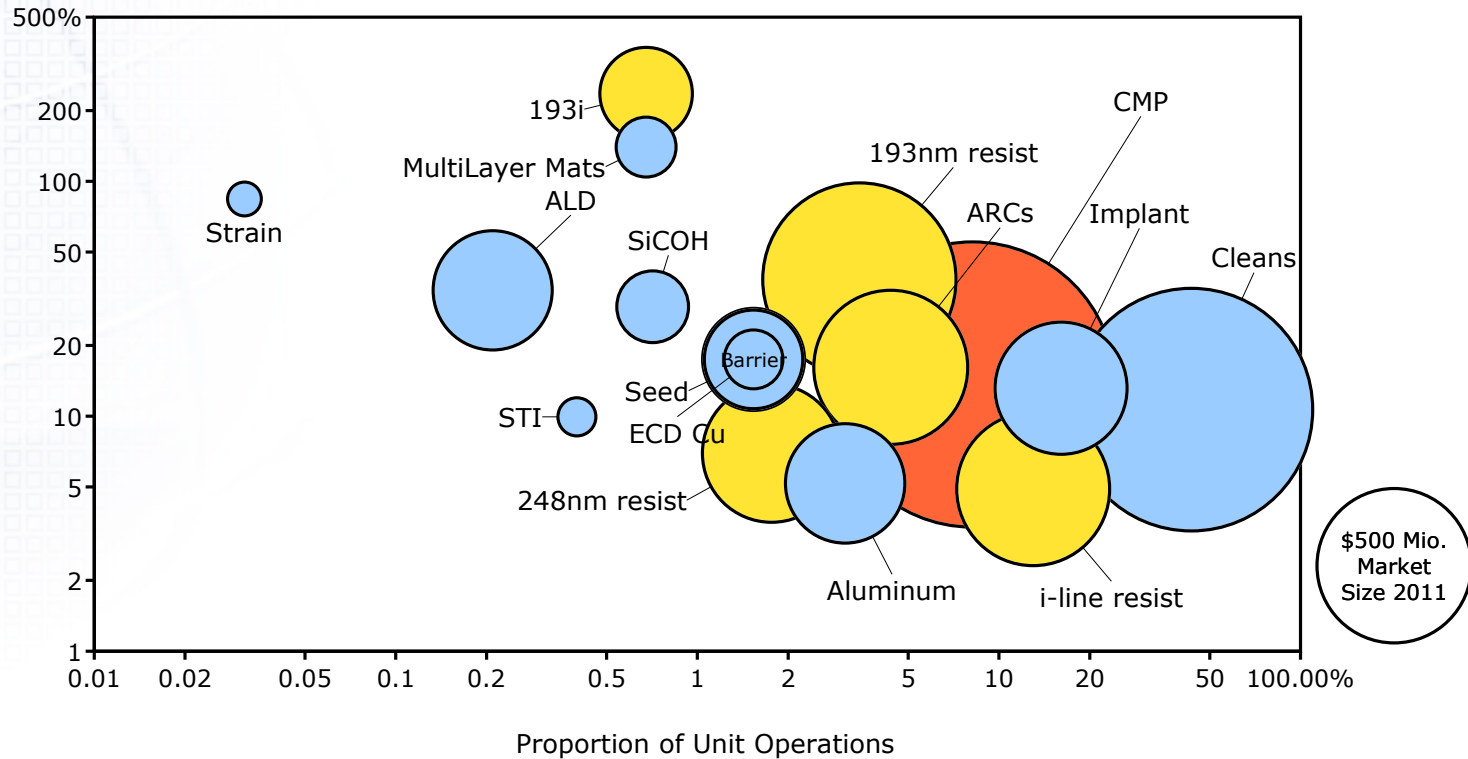


COMPARISON – CMP AND LITHOGRAPHY CONSUMABLES



WHY LOOK AT LITHO?

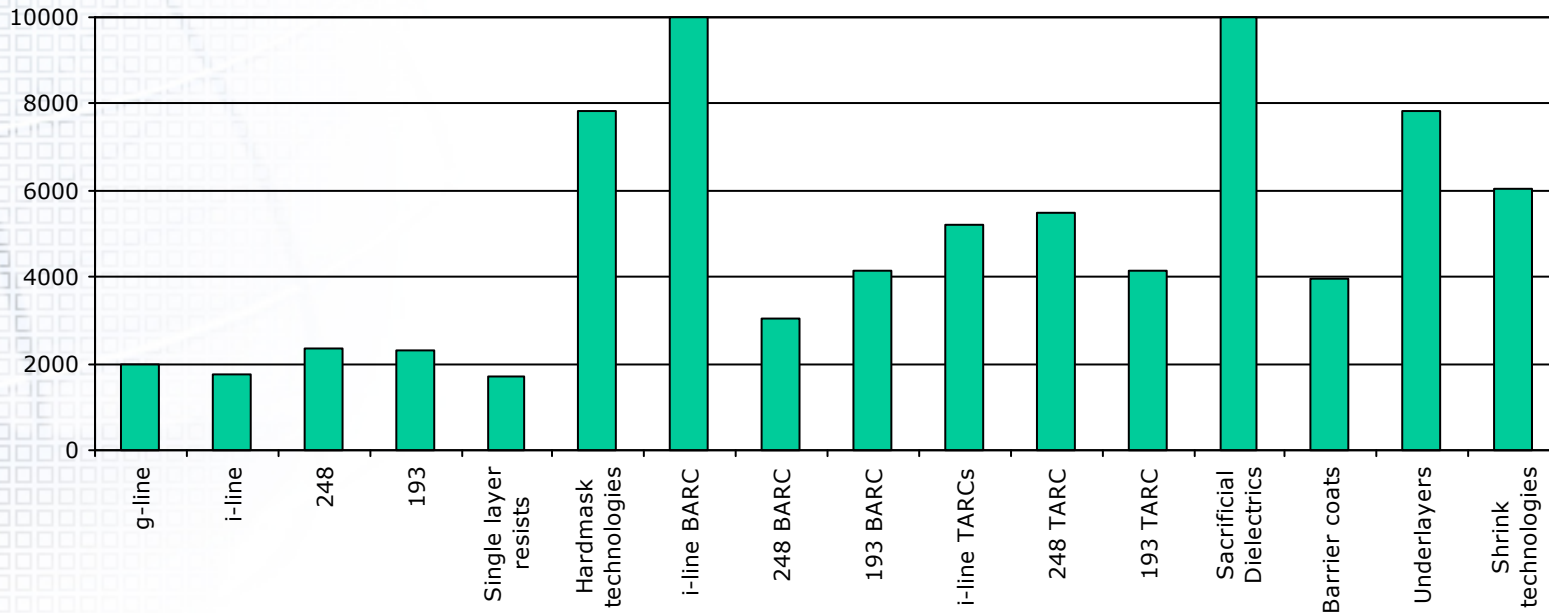
CAGR Unit Operations - 07 to 11





COMPARISON - LITHOGRAPHY

- Herfindahl Indices by market



- Several single supplier markets
- High concentrations in most markets
- Resists are among the least concentrated markets, and are ripe for consolidation



REASONS WHY LITHO HAS NOT CONSOLIDATED

- At any given time, there can be upwards of 50 individual product requirements under evaluation, each with its own unique needs
- For example, on an advanced logic device for each node and shrink, there can be:
 1. Active area/ SDI – 1 critical layers
 2. Gate – 1 critical layer
 3. Contact – 1 critical layer
 4. M1 – 1 critical layer
- Multiply this by 4 or 5 logic companies as well as DRAM, NAND, NOR, at Samsung Hynix, Micron, Elpida, etc.
- A litho materials supplier will need a team of about 3 to 5 people for each qual. The team will require support from chemists, technicians, metrology, lithographers, client managers, etc.
 - Each team will cost about \$3 to \$5 million in labor per year PLUS capex required for latest exposure tool
 - A leading supplier may be able to do about 10 quals per year
- Viable segment and niche strategies still exist



CURRENT MARKET FOR M&A



M&A ACTIVITIES

- **Have A Strategy In Place:**
 - Need to develop a strategic operating plan and budget that incorporates managements' thinking on the best and most efficient path to success
 - Understand the funding requirements of your growth plan before you begin, and make sure that the needed financial resources are available to your company
- **Available Financing:**
 - Although lenders are more disciplined than before, there is still debt funding available to rational leverage ratios and at very low interest rates
 - In addition, there is a tremendous amount of private equity available to well managed companies seeking to expand in the current market



M&A ACTIVITIES

- **Tremendous Market For Acquisitions:**
 - Valuations for acquisitions are no longer at the bottom unless a distressed company is involved
 - Pricing is rational and even large companies that previously overpaid significantly for businesses are working hard not to make that mistake again
 - Privately owned and smaller market cap companies are in a position to compete effectively for acquisitions, and can usually win out if a personal relationship between buyer and seller already exists or can be developed
 - For all acquirers, the keys for a successful acquisition are to understand the company you are buying, negotiate a fair deal, ask the right questions in due diligence and have a post-acquisition integration plan in place the day the transaction is closed
- **Bottom Line:**
 - We expect a significant amount of strategic M&A over the next 2 years
 - Need to get there first will be critical to succeed



CONCLUSIONS



CONCLUSIONS

- Lithography case study proves that a broad number of suppliers can survive and invest in the business
- Strategic M&A to drive consolidation, not necessarily driven by high number of suppliers or industry competitive forces
- We do not expect to see the number of major/leading suppliers change significantly, in slurrries due to:
 - Growth market
 - Strong financial performance
 - Strength of incumbent suppliers
 - Need for development work at new nodes
 - Continued success of new entrants i.e. Asahi Glass Chemical
- The industry is still looking for a second strong viable competitor to Rohm and Haas – consolidation (of technologies) may be a mechanism to establish a second supplier to Rohm and Haas
 - End-users are still putting potential suppliers in business, but there have been issues with IP
 - Several companies have emerged/shown promise in the past, but have not been able to “make it happen”
 - Cabot Microelectronics is emerging as a strong second alternative and has been successful, so far
- Copper growth in DRAM and NAND can shake up the market going forward



QUESTIONS



QUESTIONS ?

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