



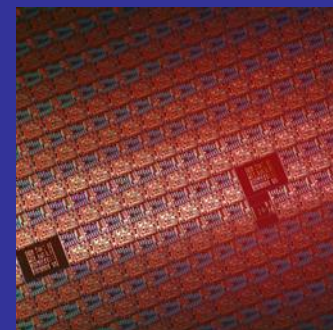
Accelerating the next technology revolution

# Sept 2012 Resist TWG Survey Results

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SEMATECH

# Survey results



- Review: The current outgas testing solution is broken
  - Not enough tools
  - Current tools do not have enough capacity
  - Tools are fragile and not well understood
    - Difficult to meet certification specifications
    - Tools easily contaminated, taking significant time to recover
  - Industry needs to come up with a faster, cheaper, and more reliable testing methodology
- Purpose: understand changing needs for outgas testing within the EUV materials community
- Survey sent to 9 material suppliers
  - Responses from all

# July 2012 Outgas tool status & capacity



	Status	Tested to date	Current Throughput (samples per month)	Anticipated need (per month)
ROX	Up and running	25	8 → 24	
EUVT	ETA August, with immediate installation and certification	0	40 - 80	
NIST	Certified Aug/Sept 2011	11 (6 customer samples)	6	
EIDEC	Certification in progress	0	30 - 40	
IMEC	Recently certified	0	~20	
LTJ	Certified	no data		
Current capacity		36	<b>14</b>	<b>~250</b>
Projected Total Capacity			<b>~145</b>	

Are these values correct?

# Question 1 & 2



- How many samples per month do you think you need to test in the next 6 – 9 months to prepare for NXE 3300 introduction?
  - Total: 35 – 42 samples per month
- How many samples per month do you think you will need once your customers have their EUV exposure tools?
  - Total: 50 – 57 samples per month

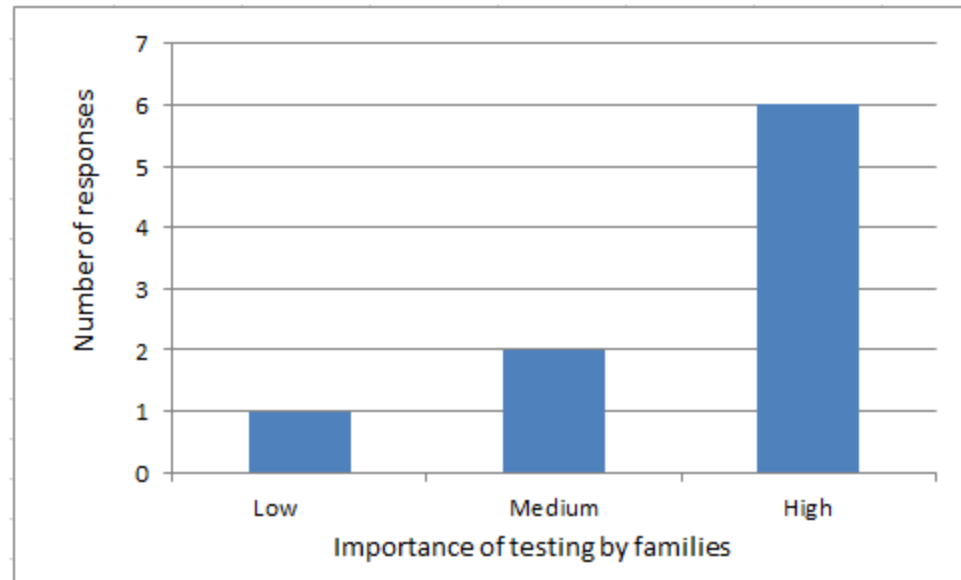
It varies with the development stage of manufacturing at customers. It would not be so significant in reducing the number of test samples by applying family definition at an early stage. The family definition would be very effective to reduce sample number at the final stage, because most samples would probably include same PAG, protecting group, and, Quencher with slightly varying loading ratio to customize the resist formulation to customer needs. The proof of concept on family definition is very important.

Resist suppliers will collect the data showing any tendency of outgassing by using their own latest formulations individually. Then each suppliers will share the data with ASML and each IDMs to discuss and achieve the conclusion on whether family definition on dedicated resist formulation could be applied or not. In the mean time, the discussion amongst suppliers, consortium, and ASML (and IDMS) should continue.

# Question 3



- How important is testing by families to your company?



Some concern over applicability as outgassing is impacted by many factors unique to each vendor's platform

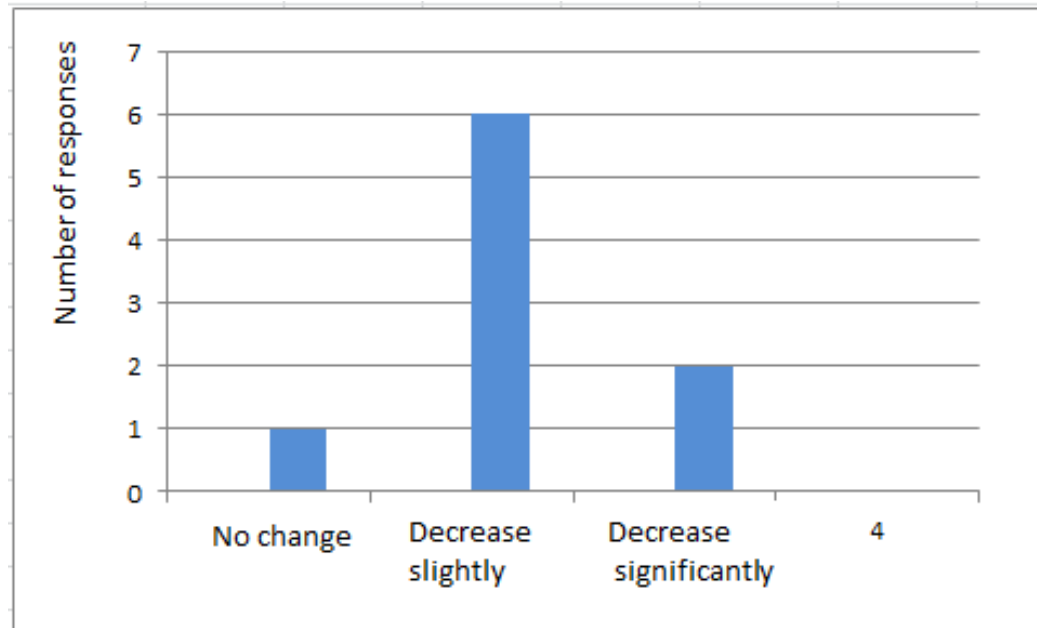
Family definition rule should be useful to decrease total amount of testing only if all company (resist supplier, chip maker, tool supplier) entirely agree with the rule. Also, there is a risk that something unexpected may affect the real outgassing amount.

This is very high value as we believe many/all materials will fall in a low outgas regime

# Question 4



- If we are able to test by families, how will this affect the number of resist samples you need to test?

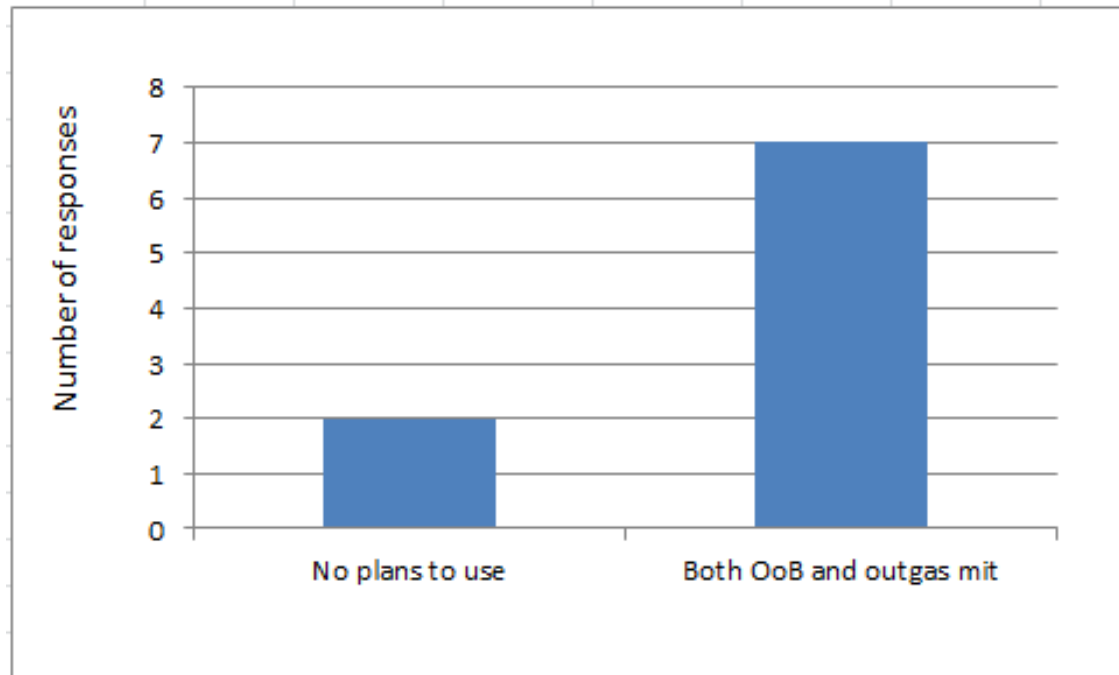


If TC application is permitted as outgassing test free pass by ASML, this situation may change.

# Question 5



- What are your plans for topcoat use?



If TC application is permitted as outgassing test free pass by ASML, this situation may change.

# Question 6



- Given what we know about the worldwide witness plate testing capacity, do you think we need to increase outgas testing capacity?
  - Response: 100% yes

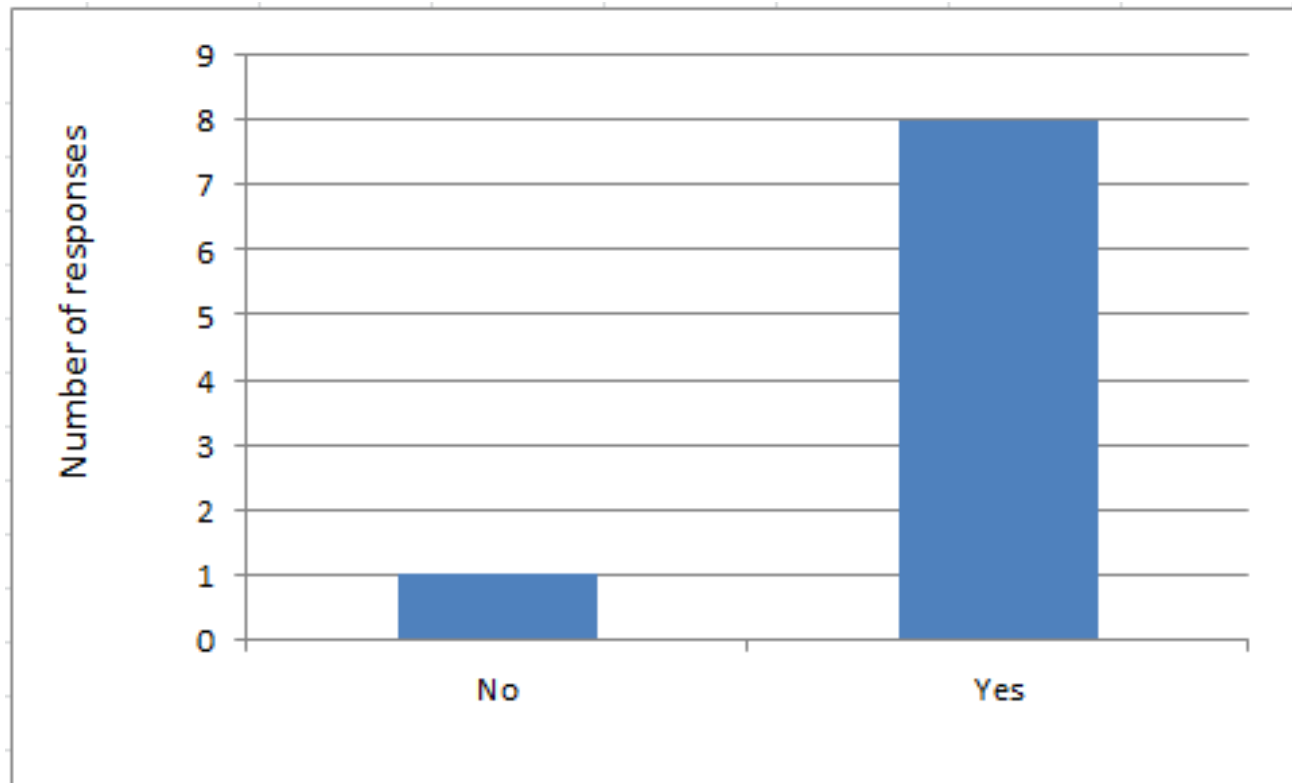
Definitely. WP Outgassing is a major show stopper to having advanced EUV resists evaluated on NXE3100 tools. We expect this will continue to be an issue with the arrival of the NXE3300 tools in the field



# Questions 7

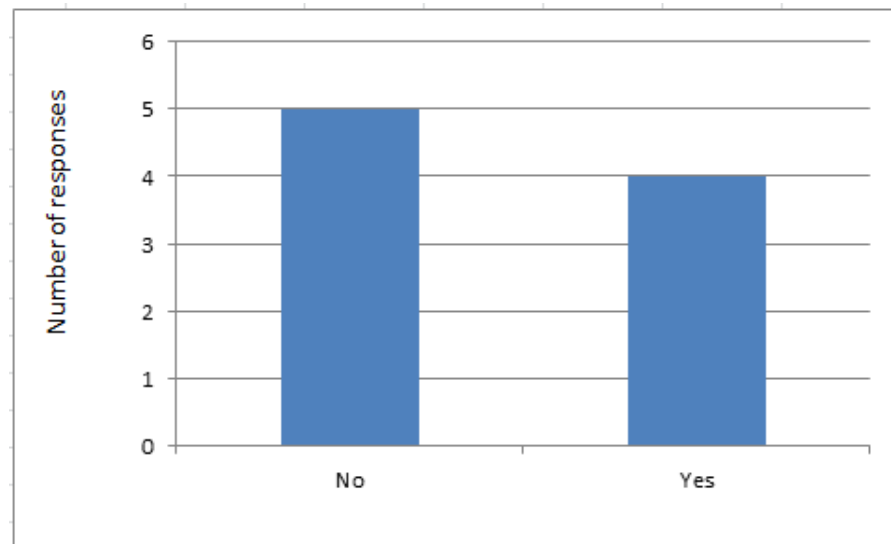


- Did you take into account outgassing properties at the early stage of resist development?



## Question 8

- Did you think resist outgassing requirements are significantly slowing down resist development? If yes what can be done from your point of view ?



To accelerate the resist development in earlier stage, alternative method which is much easier than witness plate method would be beneficial.

This would only be an easy and fast screening for outgassing, so that the sample will be allowed to be exposed on NXE with, for instance, just 5 wafers, using a dedicated exposure area.

# Additional comments



Revisit assumptions around equivalency of test sites with different combinations of EUV and/or e-beam exposure schemes

Availability of RGA Testing to aid development of low outgassing resist platforms

# Oct 2012 Outgas tool status & capacity



	Status	Tested to date	Current Throughput (samples per month)	Anticipated need from supplier (per month)	Total anticipated need based on discussion (per month)
ROX	Up and running	53	8 → 24		
EUVT	August delivery, working towards Q4 certification & customer availability	0	40 - 80		
NIST	Certified Aug/Sept 2011	15 (9 customer samples)	6		
EIDEC	Certification complete, ready to start	0	30 - 40		
IMEC	Recently certified	10	~20		
LTJ	Certified	no data	no data		
<b>Current capacity</b>		<b>78</b>	<b>~70</b>	<b>42 -&gt; 57</b>	<b>250, Same as current MET tool capacity</b>
<b>Projected Total Capacity</b>			<b>145</b>		