Solution Selling 1977:

Semiconductor Equipment Marketing Shifts from Selling Tools

Applied Materials has always had a reputation for recognizing customer needs early on. This AMAT ad from 1977 is one of the earliest examples of a marketing shift from selling products to selling solutions to specific application needs. This marketing revolution in the semiconductor equipment industry was brought by Bob Graham. It would turn out to be what would decades later be called 'blue ocean strategy.' At the time, competitors scoffed at this as being obvious, leaving the market position of being a solution provider open to Applied Materials for years. It also provided a new framework for innovation that would serve Applied for decades, as they began to search for specific application problems customers were having … for which their equipment could be used to provide a unique solution.

(1) One micron thick—continuous process
(2) Five micron thick Epi:
2 runs per hour—single station
3 runs per hour—dual station
(3) 5000 A
(*)

	Wafer/Hr.	A/Dep	Process
Polysilicon:	200	5000	SiH_4
Silicon Nitride:	170	1000	SiH_4
Silicon Nitride:	120	1000	SiH_2Cl_2
Silicon Dioxide:	70	5000	SiH_2Cl_2

‡CF_4 or C_2F_6 + O_2

April 5, 1977

			Model No. Station	HIGH PRODUCTION														PRODUCTION								PILOT LINE					
				AMS-2000		AMH-6000 Dual		AMC-7600 Single		AMC-7000 Single		AMG-500 Single	AMG-500 C Single	AMP-9000 LPCVD		AMP-3300 Plasma		AMS-1200 Dual		AMS-1045		AMV-1200 Dual		AMV-800 Dual		AMS-1000		AMV-1200D Single		AMV-800D Single	
			Configuration Heating	Continuous Resistance		Horizontal R.F.		Cylinder Radiant		Cylinder Radiant		Cylinder R.F.	Cylinder R.F.	Tube Resistance		Vertical Resistance + R.F.		Vertical Resistance		Semi-Cont. Resistance		Vertical R.F.		Vertical R.F.		Semi-Cont. Resistance		Vertical R.F.		Vertical R.F.	
			Wafer Size	3"	4"	3"	4"	3"	4"	3"	4"	Random	Random	3"	4"	3"	4"	3"	4"	3"	4"	3"	4"	3"	4"	3"	4"	3"	4"	3"	4"
			Wafer Capacity/Station	Continuous		24	12	30	14	18	—	0 in²/Run	60 in²/Run	200	200	25	14	8	5	21	10	8	5	—	—	10	3	8	5	—	—
			Wafer Throughput/Hr.	160_1	80_1	72_2	36_2	60_2	28_2	36_2	—			(*)	(*)	50_3	28_3	24_1	15_1	84_1	40_1	24_2	15_2	—	—	40_1	12_1	16_2	10_2	—	—
	REACTANTS		**AMBIENT**	**TEMP. (°C)**																											
EPITAXIAL SILICON	Silane (SiH_4)		H_2	1000-1050		●		●		●												●	●				●	●	
	Dichlorosilane (SiH_2Cl_2)		H_2	1050-1100		●		●		●												●	●				●	●	
	Trichlorosilane ($SiHCl_3$)		H_2	1100-1150		●		●		●												●	●				●	●	
	Silicontetrachloride ($SiCl_4$)		H_2	1150-1200		●		●		●												●	●				●	●	
WAFER ETCH/CLEAN	Hydrogen Chloride (HCL)		H_2	800-1200		●		●		●		●	●	●		● ‡						●	●				●	●	
ALUMINA (Al_2O_3)	Aluminum Trichloride with Carbon Dioxide ($AlCl_3$ - CO_2)		H_2	850-950																		●	●				●	●	
SILICON NITRIDE (Si_3N_4)	Silane with Ammonia (SiH_4 + NH_3)		N_2	25-400												●													
	Dichlorosilane with Ammonia (SiH_2Cl_2 + NH_3)		N_2	750-900										●															
	Silane with Ammonia (SiH_4 + NH_3)		N_2	750-800																		●	●				●	●	
	Silane with Ammonia (SiH_4 + NH_3)		H_2	950-1000		●		●		●												●	●				●	●	
POLYSILICON	Silane (SiH_4)		N_2	650-700										●								●	●				●	●	
	Silane (SiH_4)		H_2	850-950		●		●		●												●	●				●	●	
SILICON DIOXIDE (SiO_2)	Silane with Oxygen (SiH_4 + O_2)		N_2	350-500	●									●				●	●						●					
	Doped Oxides (SiH_4 + O_2 + Dopant)		N_2	400-500	●													●	●						●					
	Silane with Nitrous Oxide (SiH_4 + N_2O)		N_2	750-850																		●	●				●	●	
	Dichlorosilane with Nitrous Oxide (SiH_2Cl_2 + N_2O)		N_2	900-950										●															
	Silane with Carbon Dioxide (SiH_4 + CO_2)		H_2	950-1000		●		●		●												●	●				●	●	
EPITAXIAL III-V COMPOUNDS	Gallium Arsenide Phosphide (Red)		H_2	750-800								●																	
	Gallium Phosphide (Yellow or Green)		H_2	800-850									●																	
SPECIAL DEPOSITION																															
DUAL LAYER IN-SITU NITRIDE/OXIDE	Dichlorosilane with Ammonia (SiH_2Cl_2 + NH_3)		N_2	850-950										●															
	Dishlorosilane with Nitrous Oxide (SiH_2Cl_2 + N_2O)																														
	Silane with Ammonia (SiH_4 + NH_3)		H_2	950-1000				●		●												●	●				●	●	
	Silane with Carbon Dioxide (SiH_4 + CO_2)																														
SILICON ON SAPPHIRE	Silane (SiH_4)		H_2	950-975		●																●	●				●	●	

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