Assembly & Test
Benchmarking Study

max

Why Engage in an A&T Benchmarking Study?

- Cost structure shifts to back-end

- Missing a centrally organized benchmark entity

- Strong interest from multiple ASAT suppliers and IDM companies – knowledge sharing

- Turn knowledge into driving actions

- Significant potential for efficiency and cost improvements

- Proven track record from FOA best benchmarking administrator

max

Performance efficiency Examples

| Area	Typical Level	Benchmark
Full Lot Size	75%	90%
Changeover Frequency	>70%	
First Pass Yields	95%	98%
X-Factor	>4X	2X
Staffing Levels	120%	100%
Bottleneck OEE	55% - 65%	>90%
M-Ratio	<1:1	9:1
Availability – Mean / CV	<88% / >30%	>93% / 10%

From MAX Engagements

max

Proven Success (Front-End)

Fab Owners Association

- 26 IDM Companies
- 100mm – 200mm Fabs
- 40 participating Fabs

Survey #3

- Most detailed benchmark survey covering Fab performance
- 253 indices and metrics
- Automated analysis tool developed by MAX
- Robust validation process

Survey #3 2014 Fabs at Glance

24 Fabs

| 17 USA | 5 EU | 2 ASIA |

| 9 CMOS | 4 BiCMOS | 6 DISC | 5 GaAs |
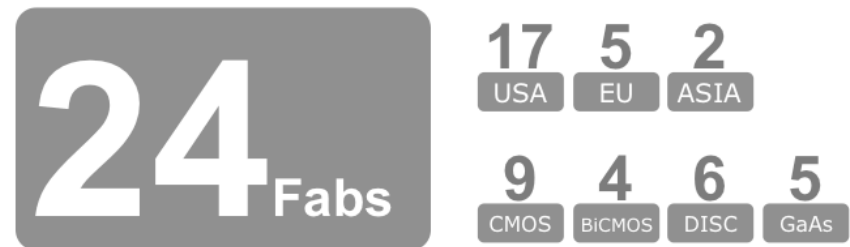
0.9M Wafers / Qtr 200mm equivalent

20M Aligns / Qtr

9,000 Tools

4,000 Operators

1,300 Technicians

700 Engineers

max

Objectives

Provide the most extensive and complete operational benchmarking analysis to participating companies

Study Quality

- Drive Data Accuracy
- Standardize Questions Definition and Scope
- Evaluate Year on Year Data
- Provide Actionable Information
- Incorporate Participants Feedback

Participants (Signed On)

IDM

10 Companies

15 Sites

OSAT

4 Companies

10 Sites

max

Typical Survey Process

Phase 1 – Preparation

- Final Participants List Closure
- NDA & Benchmarking Agreement Signoff
- Study Questionnaire Review & Participants feedback
- Agree on Data Capture Period
- Questionnaire Revision

2 months

Phase 2 – Data Collection

- Study Questionnaire Distribution
- Kick-off Conference Calls with Each Site
- Data Collection By Site

2 months

Phase 3 – Data Validation

- First Data Review
- Second Data Review
- Third Data Review
- Data Review by Participating Sites

1 months

Phase 4 – Data Analysis

- Data Analysis
- Data Analysis tool Distribution (MS Excel w Macros)
- Final Report Distribution

1 months

max

Data Validation Process

1 Individual Site Check — -Historical Data / -Theoretical Indicators

2 Intra-Group Analysis — -Outliers / -Correlations

3 Survey Wide Analysis — -Statistical Analysis / -Ratio Analysis

4 Participant Check — -Participant Feedback / -Data Verification

max

Benchmarking Scope

Area	Operation Group	Operation Type
FOL	BACKGRIND	BACK_GRIND_INCOMING_INSP
FOL	BACKGRIND	BACK_GRIND
FOL	BACKGRIND	BACK_GRIND_THICK_MEAS
FOL	BACKGRIND	BACK_GRIND_FINAL_INSP

Area	Operation Group	Operation Type
PROBE	PROBING	PROBE_INCOMING_INSP
PROBE	PROBING	PROBE_PROBING
PROBE	PROBING	PROBE_OPTICAL_INSP
PROBE	PROBING	PROBE_INKING
PROBE	PROBING	PROBE_OPTICAL_INSP

Area	Operation Group	Operation Type
FOL	SAW	WAFER_MOUNT
FOL	SAW	WAFER_SAW
FOL	SAW	WAFER_MOUNT_CURE
FOL	2ND OPTICAL INSP	2ND_OPTICAL_INSP
FOL	2ND OPTICAL INSP	2ND_OPTICAL_GATE
FOL	2ND OPTICAL INSP	2ND_OPTICAL_INKCURE
FOL	DIE ATTACH	DIE_ATTACH
FOL	DIE ATTACH	POST_DA_CURE
FOL	WIREBOND	WIREBOND
FOL	3RD OPTICAL INSP	3RD_OPTICAL_INSP_SAMP
FOL	3RD OPTICAL INSP	3RD_OPTICAL_GATE
FOL	CLEAN	PLASMA_CLEAN
EOL	MOLD	MOLD
EOL	MOLD	POST_MOLD_CURE
EOL	MARKING	BOTTOM_LASER_MARK
EOL	MARKING	TOP_LASER_MARK
EOL	MARKING	LASER_MARK
EOL	TRIM AND SINGULAT	TRIM_SIN_AUTO
EOL	TRIM AND SINGULAT	TRIM_SIN_AUTO
EOL	4TH OPTICAL INSP	4TH_OPTICAL_INSP_SAMP
EOL	4TH OPTICAL INSP	4TH_OPTICAL_GATE

Area	Operation Group	Operation Type
PRE_TEST	REFLOW	REFLOW
PRE_TEST	TEMP CYCLE	TEMP_CYCLE
PRE_TEST	OPEN SHORT	OPEN_SHORT_1
PRE_TEST	OPEN SHORT	OPEN_SHORT_1
PRE_TEST	BURN IN	BURN_IN
PRE_TEST	OPEN SHORT	OPEN_SHORT_2
PRE_TEST	OPEN SHORT	OPEN_SHORT_2
PRE_TEST	TEMP CYCLE	TEMP_CYCLE2
PRE_TEST	X-RAY	X_RAY
PRE_TEST	MVI	MVI

Area	Operation Group	Operation Type
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	TEST_PASSES
TEST	TEST	CI
TEST	TEST	CI

Area	Operation Group	Operation Type
BACK END	BACKEND	LEADFORM
BACK END	BACKEND	TAPE_AND_REEL
BACK END	BACKEND	FINAL_INSPECTION

max

Benchmarking Questionnaire

Sections:

- Site Information
- Production
- Facility Area
- Cycle Time
- Technology
- Staffing
- Yield & Quality
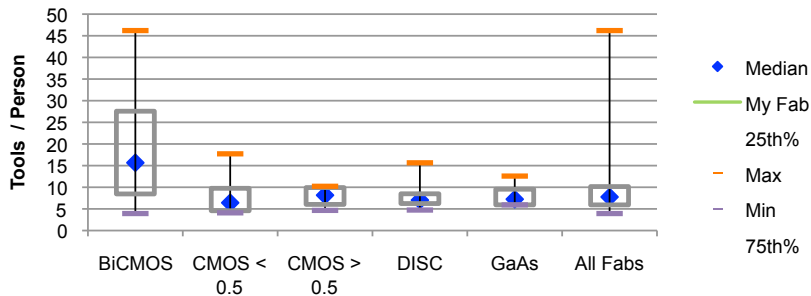- Cost
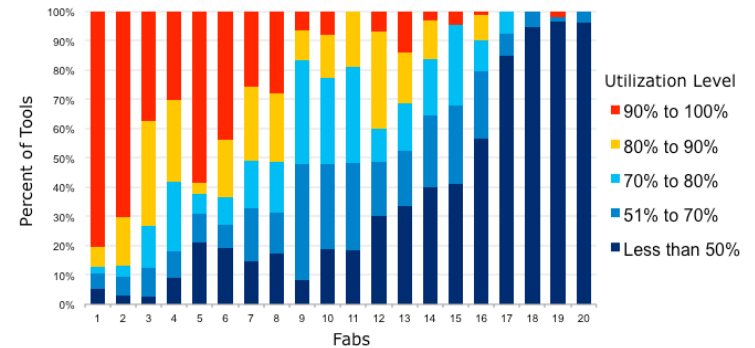- Maintenance

Analyses Sample

Average Cycle time Per Layer
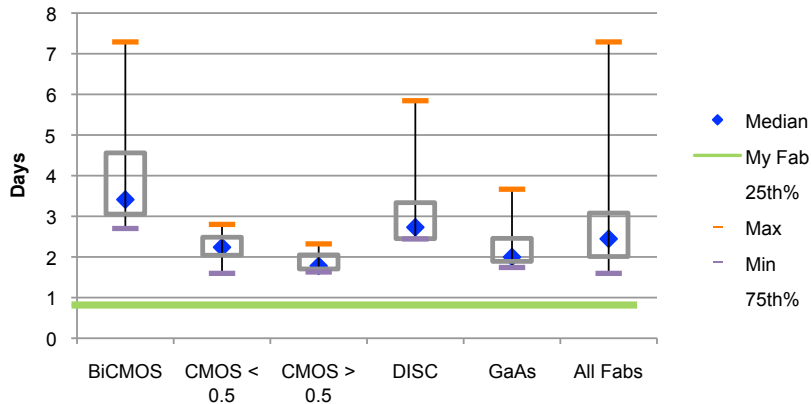
Tools per Operator

Tools by Utilization Level

max

Timeline Proposal

Time Line	1st Qtr	2nd Qtr	3rd Qtr
Questionnaire Definition	■		
Questionnaire Distribution	■		
Data Submission		■	
Data Analysis		■	■
Survey Results			■

max

Who we are

Transforming Semiconductor, Solar and LED factories' performance

88 Experts

140 Programs

Shared Gain Model

- Throughput
- Cycle Time
- Yield
- Cost
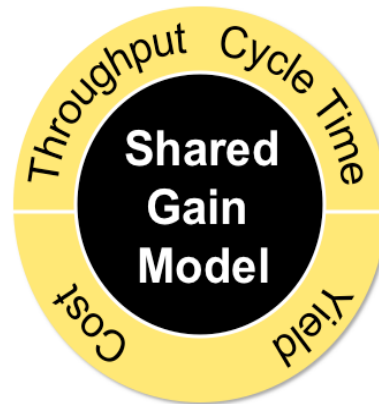
>10:1 Return on our fee

CAPEX Avoidance
Personnel Productivity
Yield Improvement
Cost Savings

Lineage

1999	2003	2007	2011	2013

Established in NJ, USA

First 300mm Factory

First M&A

Site Mgmt

First EU Project

Shared Gain Model

Multi-site Project

Global IE Mgmt
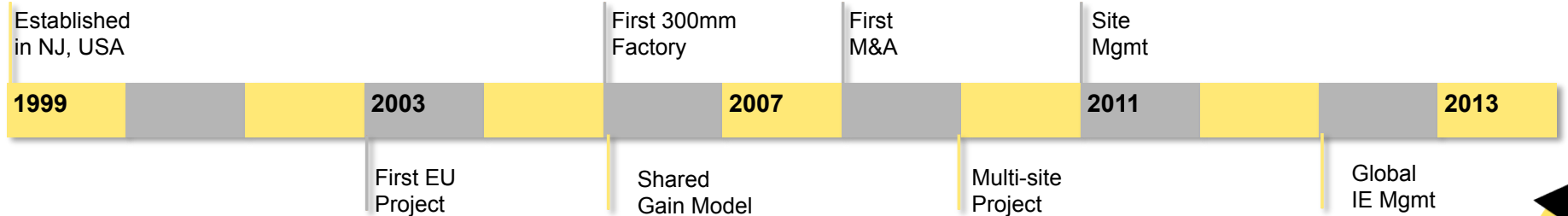
max

Lean Six-Sigma Foundation

MAX Black Ops™ - The Villanova University Lean Six Sigma Program

5
Master Black Belts

35
Black Belts

45
Green Belts

Program - ASQ Certified

Tailored for Semiconductors/LED Industry

Lean principles as a way of life

Find reduce and eliminate waste

1. Quantify loses comparing cost to bottom up calc.
   - Investigate where significant

2. Look for performance improvement in equipment or process.

3. Compare revised performance to benchmark where possible
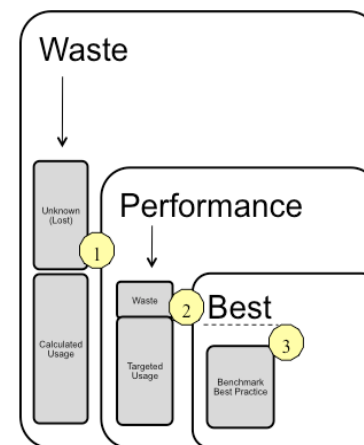
max

MAX - The Benchmarking Authority in Semiconductors

Associations

FAB OWNERS ASSOCIATION

Benchmark Admin
Associate Member
of the Year - 2009

semi

ITRS Member
ISMI Member

CS MANTECH ™

Board of Directors
TPC Member

Papers and Presentations

CS COMPOUND SEMICONDUCTOR
CONNECTING THE COMPOUND SEMICONDUCTOR COMMUNITY

Semiconductor INTERNATIONAL

SEMATECH
Accelerating the next technology revolution.

SEMICON® West

max

Client Experience

Quantify Potential

ORE™ Study

Litho Stepper - OEE

Benchmark: 90% OEE
- Based on stepper OEE
- Track down time included in stepper downtime

Impact of operator attendance
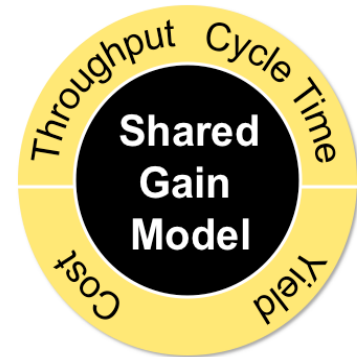
Implement Solutions

Manufacturing Operations

Factory Design & Build

Supply Chain Management

Driving Operational Excellence

Factory Management Systems
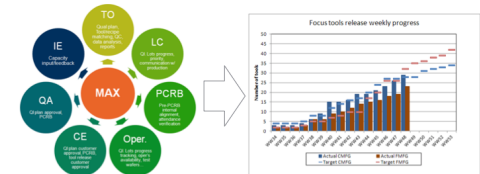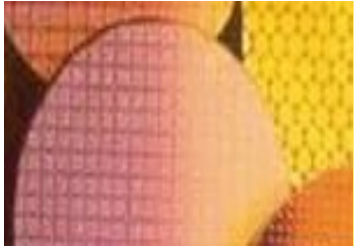
Site Management Services

Gain $$

Throughput   Cycle Time

Shared Gain Model

Cost   Yield

max

THANK YOU

To Participate Contact:

asatbenchmarking@maxieg.com

max