TO IMPROVE DAILY PRODUCTION OUPUT
Using Lean Manufacturing Approach At PT. XYZ Batam

Dadang Redantan

Industrial Engineering Program, Faculty of Engineering, University of Riau Kepulauan (UNRIKA)
Jl. Letjend Suprapto, Bukit Tempayan, Batu Aji, Kota Batam, Kepulauan Riau 29425
E-Mail : Dadang.redantan@yahoo.co.id

ABSTRAK

Penelitian ini bertujuan untuk meningkatkan output produksi harian tipe LGA Sirkuit Terpadu (IC) di PT. XYZ Batam untuk memenuhi permintaan pelanggan. Metode yang digunakan adalah Lean Manufacturing. Hasil yang ditunjukkan dengan menghilangkan beberapa limbah akan meningkatkan kapasitas.

Kata kunci : Produksi Ouput, Pengiriman On-time, Balancing, Produksi IC, Inspeksi Akhir.

1. INTRODUCTION

PT. XYZ is an electronic manufacturing company who produce Integraged Circuit (IC). This company in the daily operation will produce the output using make to order strategy. As long as customer demand equal to or less than the existing production capacity, company should have no issue to serve customer demand.

One of the main customer suddently request output more than existing capacity, existing capacity is only set for 220,000 unit per day while customer demand is 300,000 unit per day.

This research mean to apply Lean Manufacturing concepts to find out all the possibility of waste in production process and eliminate wast to improve daily production output to meet customer demand.

2. METHODOLOGY OF RESEARCH

2.1. Lean Manufacturing

Lean Manufacturing is systematic approach to eliminate wast and change the process. This will reach by identify and eliminate waste with continuous improvement (AP, Wisnu and Partner, 2013) Lean Manufacturing motivate to make flexibility in production system which able to adopt in customer demand with sleam production and low inventory stock (Gaspersz, Vincent, 2007). Lean Manufacturing will use to eliminate waste and create balance production capacity to meet customer demand.

Lean Manufacturing has become common theme in today's manufacturing environment, for both commercial and defense industries. Lean Manufacturing is the common name for concepts exemplified by the Toyota Production System, with the overall philosophy of eliminating the source of waste in the manufacturing process (Altarum et all).

There are 8 type of waste which summary by word of DOWN TIME, consist of defects, over production, waiting, non-production hour, transportation, inventory in excess, motion and extra processing.

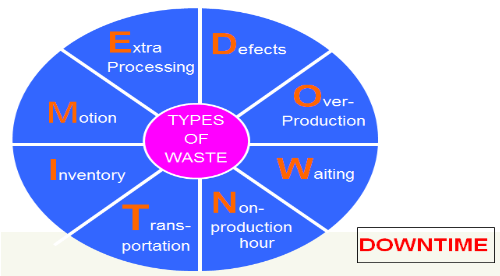

Figure 1. Eight (8) Type of Waste Which Summary by word of DOWN TIME.

Table 1. Customer Demand July ~ December 2015

Pacakge	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
LGA IC	6.000.000	6.000.000	6.000.000	6.000.000	9.000.000	9.000.000

Table 2. Delivery to Customer July ~ December 2015

Pacakge	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
LGA IC	5.950.000	6.000.000	5.950.000	6.000.000	6.600.000	6.600.000

3. RESULT AND DESCRIPTION OF RESULT

Following is all the flow for IC LGA production from wafer incoming inspection and end by Final Visual Inspection and Packing the product (Figure 1).

Base on the data from Customer Service Department, below is customer demand data from July 2015 up to December 2015.

We can see there is an increase of demand in November 2015 from average of 6,000,000 units per month become 9,000,000 units per month (Table 1).

Base on existing production capacity condition, company not able to meet all the customer requirement. Especially for November 2015 and December 2015, company only able to deliver 6,600,000 unit vs actual demand 9,000,000 units (Table 2).

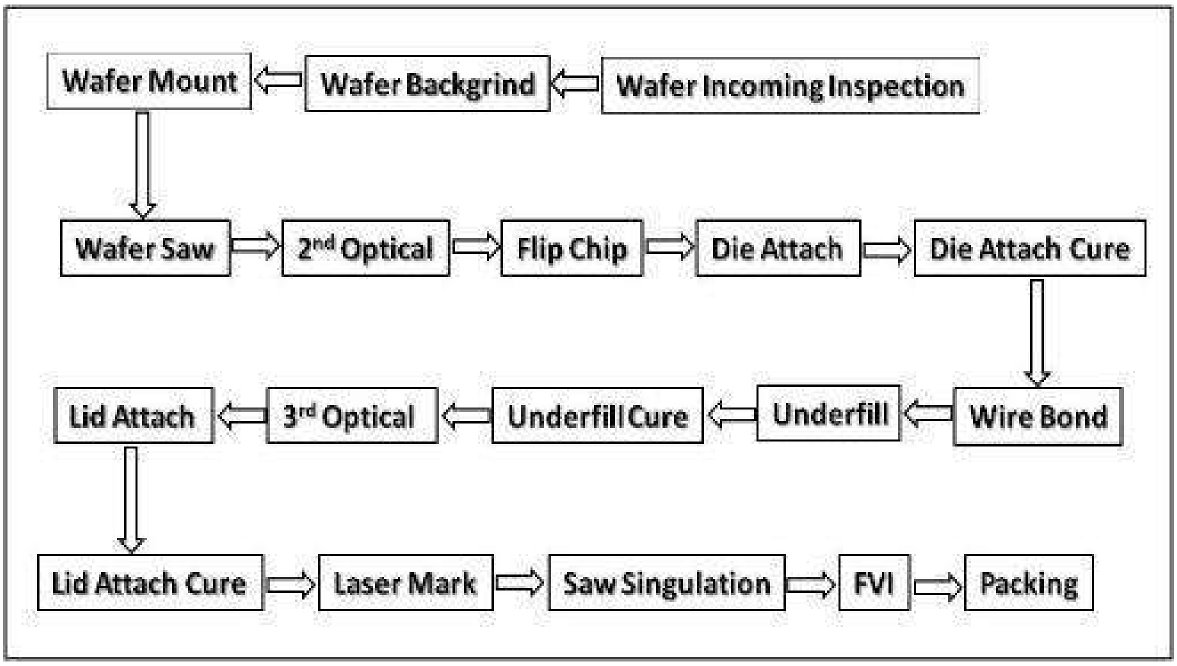

Figure 2. Flowchart for IC LGA Production.

Table 3a. The Actual Capacity Per Every Single Process of LGA IC

No. Sample	INCOMING	BACKGRIND	WF MOUNT	WAFER SAW	2ND OPT	Flip Chip	Die Attach	Die Attach Cure	WIRE BOND
1	10332	24145	21713	8145	10087	5092	3944	24394	1987
2	10330	24238	22638	8090	10099	5059	3935	24381	1982
3	10398	24288	21213	8141	10053	5101	3919	24396	1983
4	10349	24161	21796	8123	10172	5071	3955	24393	1978
5	10346	24149	21213	8141	100172	5071	3951	24386	1988
6	10393	23950	22156	8100	10204	5047	3934	24389	1975
7	10374	24126	22434	8118	10073	5046	3936	24388	1978
8	10354	24365	21647	8121	10112	5021	3945	24391	1987
9	10337	23928	22398	8117	10075	5081	3926	24380	1982
10	10365	24376	22377	8078	10131	5057	3949	24379	1987
11	10434	24512	21489	8131	10088	5072	3945	24379	1987
12	10407	24042	22082	8088	10131	5029	3959	24394	1989
13	10314	24042	22371	8093	10128	5038	3919	24395	1983
14	10393	23936	22510	8086	10061	5089	3959	24386	1984
15	10317	24164	22089	8155	10098	5038	3926	24378	1989
16	10312	24407	22031	8110	10155	5082	3952	24379	1989
17	10378	23986	21913	8095	10151	5080	3956	24390	1986
18	10381	24022	21909	8131	10060	5080	3945	24380	1974
19	10417	24229	21718	8101	10048	5061	3955	24387	1983
20	10392	24185	21670	8088	10099	5060	3957	24391	1988
21	10367	24490	21635	8126	10188	5083	3959	24389	1977
22	10316	24313	22490	8140	10140	5050	3930	24379	1984
23	10374	24010	22057	8106	10085	5019	3954	24388	1974
24	10339	24305	21985	8128	10184	5039	3912	24395	1989
25	10439	24117	22575	8137	10109	5118	3936	24380	1991
26	10369	24526	21764	8125	10188	5054	3927	24385	1976
27	10399	24196	22442	8108	10132	5084	3921	24389	1982
28	10389	23753	21977	8116	10166	5099	3920	24387	1976
29	10318	24190	21488	8091	10098	5078	3931	24387	1980
30	10324	24263	21242	8126	10171	5088	3950	24396	1981

Table 3b. The Actual Capacity Per Every Single Process of LGA IC

Under Fill	Under Fill Cure	3rd OPT	LID ATTACH	IA Cure	MARKING	SAWSING	FVI	PACKING
3650	24520	4332	2564	25721	10399	3758	4350	6777
3649	24521	4348	2564	25709	10343	3773	4270	6795
3602	24521	4340	2559	25723	10420	3731	4224	6764
3630	24529	4346	2577	25719	10374	3784	4374	6772
3636	24512	4364	2573	25723	10418	3748	4359	6775
3625	24517	4365	2563	25717	10392	3783	4273	6761
3627	24524	4362	2570	25712	10383	3752	4338	6811
3602	24526	4351	2573	25707	10375	3737	4331	6769
3599	24521	4340	2582	25717	10330	3760	4297	6735
3609	24521	4362	2557	25712	10420	3764	4345	6787
3614	24521	4356	2560	25713	10350	3753	4341	6735
3648	24526	4344	2564	25711	10369	3743	4304	6765
3600	24518	4361	2580	25704	10405	3745	4334	6782
3625	24529	4380	2579	25717	10371	3742	4258	6785
3617	24513	4339	2567	25720	10399	3766	4356	6759
3592	24525	4350	2583	25716	10359	3757	4291	6738
3630	24530	4367	2572	25707	10408	3743	4302	6753
3642	24527	4333	2571	25715	10353	3743	4236	6759

Table 3b. The Actual Capacity Per Every Single Process of LGA IC

Under Fill	Under Fill Cure	3rd OPT	LID ATTACH	IA Cure	MARKING	SAWSING	FVI	PACKING
3642	24531	4355	2558	25716	10442	3766	4332	6773
3628	24514	4352	2560	25713	10399	3776	4348	6794
3609	24530	4366	2571	25714	10384	3765	4289	6763
3609	24530	4366	2571	25714	10384	3765	4263	6815
3636	24526	4358	2564	25710	10356	3768	4269	6752
3621	24522	4371	2582	25713	10417	3740	4336	6746
3648	24519	4343	2579	25707	10343	3759	4309	6768
3620	24524	4338	2567	25716	10358	3747	4251	6731
3623	24526	4376	2561	25712	10426	3756	4237	6788
3639	24527	4361	2566	25712	10416	3757	4314	6781
3635	24520	4377	2568	25710	10402	3742	4341	6804
3629	24512	4346	2555	25720	10361	3733	4329	6800

Table 4. Summary All The Unit Per Hour Machine

Station	UPH / Machine
Incoming Inspection	9329
Backgrind	21768
Wafer Mount	19811
Ws	7303
2nd Opt	9108
Flip Chip	4561
Die Attach	3546
Die Attach Cure	21948
Wire Bond	1785
Under Fill	3262
Under Fill Cure	22070
3rd Opt	3919
Lid Attach	2312
LA Cure	23142
Marking	9346
Saw Sing	3380
Fvi	3876
Packing	6094

Below table 3a – 3b is show the actual capacity per every single process of LGA IC. From above detail we can summary all the unit per hour machine capacity in below table 4.

Below is data of machine station, operator allocation and machine allocation for all process.

Table 5. Data of Machine Station, Opertor Allocation and Machine Allocation for All Process

Station	Operator	Machine Alocation	Machine Available
Incoming Inspection	2	2	4
Backgrind	1	1	1
Wafer Mount	1	1	1
Ws	2	2	3
2nd Opt	2	2	3
Flip Chip	3	3	4
Die Attach	4	4	7
Die Attach Cure	1	1	1
Wire Bond	5	10	12
Under Fill	5	5	5
Under Fill Cure	1	1	1
3rd Opt	3	3	5
Lid Attach	7	7	7
LA Cure	1	1	1
Marking	2	2	4
Saw Sing	6	6	6
Fvi	3	3	5
Packing	4	4	5

We can summary all the capacity per day for all the process flow as per below graph, we can see that 3rd optical inspection station and final visual inspection station is 2 station which become bottle neck for the operation to meet customer demand.

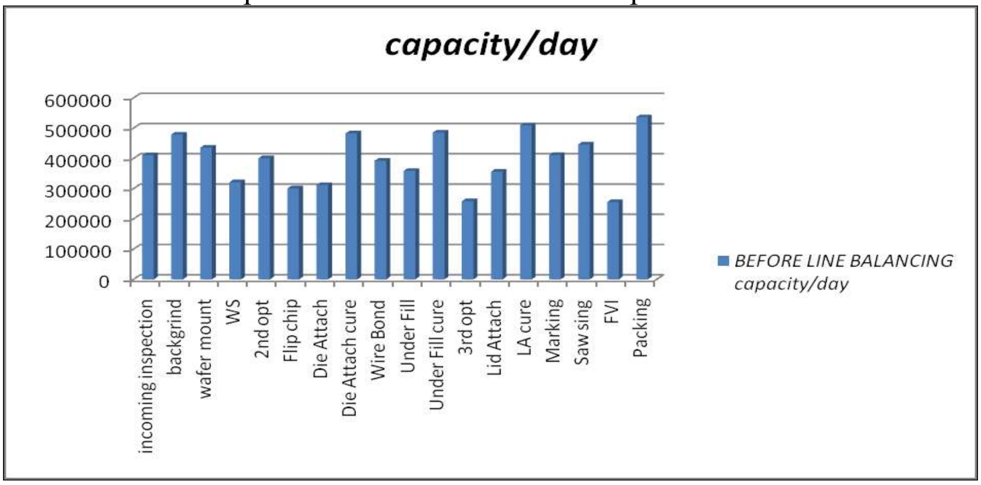

Figure 3. Capacity Per Day Before Line Balancing Chart.

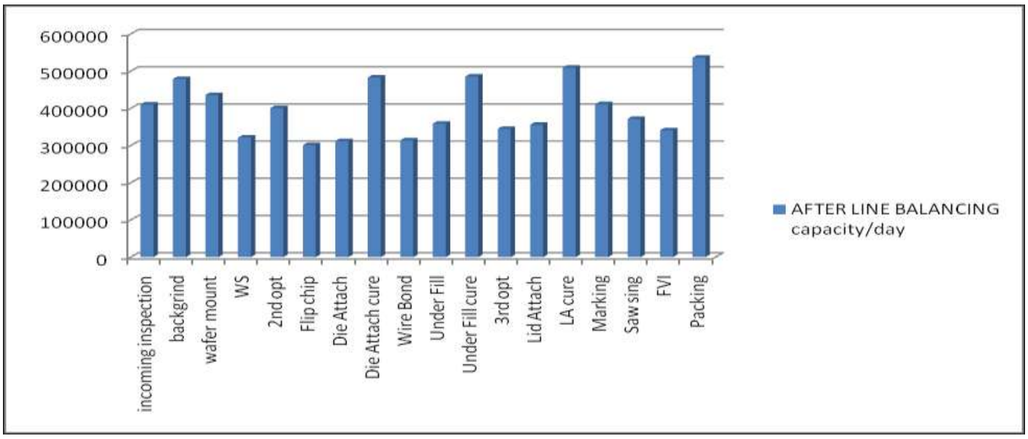

Figure 4. Capacity Per Day After Line Balancing Chart.

After line balancing we can see below is capacity per day for all process flow on figure 3 and 4. Base on existing condition, company not able to meet all customer demand which show in the following on time delivery data in below chart. After the improvement, we can see that starting march 2016 company able to meet most of the customer demand which show in following chart.

Figure 5. Delivery Ontime December 2015 Chart.

Figure 6. Delivery Ontime March 2015 Chart.

4. CONCLUSION

The research identify there are two station which impact alot of waiting the production process due to bottle neck capacity in 3rd optical inspection station and final visual inspection station. By applied line balancing methode as one of the Lean Manufacturing tools, we can increase the capacity in the two mension bottle neck. We can see the improvement by comparing on time delivery data before and after imrovement.

REFERENCES

A.M. Kilpatrick, Lean Manufacturing Principles : A comprehensive Framework for Improving Production Efficiency.

AP., Wisnu and Partner., 2013. *Lean Manufacturing panduan penerapan praktis*, e-book Serial Sistem Manajemen Industri, Indonesia.

Gaspersz, Vincent., 2002. *Pedoman implementasi program six sigma terintegrasi dengan ISO 9001 : 2000*. PT. Gramedia Pustaka Utama, Jakarta.

Gaspersz, Vincent., 2007. *Lean Six Sigma for manufacturing and service industries*, PT. Gramedia Pustaka Utama, Jakarta.

Ross & Associates Environmental Consulting, ltd. Lean and Water Toolkit, akses online 31 Agustus 2015, *URL : http://www.epa.gov/lean/environment/toolkits/water/resources/lean-water-toolkit.pdf*.

T. Phelps, T. Hoenes and M. Smith., 2003. Developing Lean Supply chains, A Guidebook, December.