Performance parameters to define "lean production level" in spanish home appliance cluster: from component suppliers to assembling factories.

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This position paper presents the set of parameters that has been defined to obtain a quick diagnosis of the level of fitness of a group of companies that are part of the total chain from raw materials and component manufacturers to assembly factories. These companies are part of the cluster of Home Appliance Finished Products*, some of them are suppliers of the other ones and a high level of consensus has been achieved to get a global competitive Finished Product. The objective of the project in the first phase was to accomplish a rapid evaluation of potential improvements to achieve a Lean Production of Finished Goods, define and prioritize pilot projects to eliminate waste.

1. MAIN STEPS OF THE PROJECT IN THIS FIRST PHASE.

CHANGE PROCESS TO LEAN PRODUCTION (LEANPRO)
1st. Phase - Year 1993

TASK	Month 7	Month 9	Month 10	Month 11	Month 12
Management and coordinate (Steering Committee)					
Presentation of the project to Directors					
Technical Audit of actual situation					
Joint discussion of the results					
Definition of the future value of parameters.					
Define method and tools in each business					
Definition of pilot projects and next planning					
MILESTONE			A	B C, D	E

2. THE BENCHMARKING: WHAT TO BENCHMARK.

The parameters to be benchmarked are defined in relation with the strategy of the company. In this case, we defined both the main characteristics of a Lean Production (see fig 1) and the activities mainly involved and, if case, redesigned (see fig2).. The figure 1 shows the external parameters (that mesure the performance of the company in this environment) and the internal parameters (that mesure the performance of the internal activities of the company to serve strategy).

The figure 2 shows the main activities to performe a lean production in this project.

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3. THE BENCHMARKING: SELECTION OF THE KEY CONCEPTS.

The benchmarking thus, has been focused on measuring such parameters that would be able to show the present level and to drive the future evolution of the company towards the lean production concept as well. Wide experience of Ikerlan in the field of the use of the power of technology to design market oriented production systems lead to the following key characteristics:

- Synchronism. This concept is related with the control of the production rhythm, that implies a fine tuning between the decision making model (planning) and the physical system (product families and layout).
- Simplicity. Today, manufacturing with a production system simpler than the competitor's means better service to the customer at lower cost. To take advantage of this challenge we need a keen sense in the use of the power of the technology.
- Flexibility to the market. This means the widest range of satisfaction in a particular technology with the shortest delivery time.
- Flow tension. The potential of this production system to improve lead time.
- Waste. In this project the waste refers to the time dedicated to activities that do not add value to the product.

4. THE BENCHMARKING: DEFINITION OF PARAMETERS.

These parameters are to be defined for every technology business. The defined parameters are listed below:. All the values are projected to a range that defines five levels (from 1 to 5). The value 1 is the worst and 5 is the champion.

- **p1- Order Combination Ratio:** Measures the level of the synchronism of the production system. The higher it is, the higher the effect of programming changes is and the more complicate is the management of the order dispatching.

Definition:

"Order Horizon"

"Scheduling Period"

Level	1	2	3	4	5
Value	10	7.5	5	2.5	1

- **p2- Production Planning Levels:** Measures the complexity of the decision system.

Definition:

"Planning Levels"

Value	1	2	3	4	5
Range	10	5	3	2	1

- **p3- Order Set-up Ratio:** Measures the adequacy of the set-up time to the flexibility requirements of the market and the trade-off between the widest range of satisfaction in a particular technology with the maximum of flexibility.

Definition:

(at worst)

"Number of Set-up families in every resource"

"Number of Set-ups acceptable in the Scheduling Period"

Value	1	2	3	4	5
Range	10	7.5	5	2.5	1

- **p4- Response Ratio:** Measures the adequacy of the response time of the production system to the market needs. To be fast is the simplest way to be flexible..

Definition:

"Lead Time"

"The most exigent delivery time of the representative market"

Value	1	2	3	4	5
Range	10	5	1	0.5	0

- **p5- Flow Tension Ratio:** Measures the potential of this production system to improve lead time.

Definition:

"Lead Time"

"Minimum time for urgent orders"

Value	1	2	3	4	5
Range	20	10	5	2	1

- **p6- Supplier's Response Ratio: Measures** the adequacy of the response time of the suppliers production system to our needs..

Definition:

Representative Delivery Time of Suppliers					
"Lead Time"					

Value	1	2	3	4	5
Range	2	1.5	1	0.5	0

- **p7- Flow Control Ratio: Measures** the control level of the production flow. Every stop, every queue in the shop floor increases the WIP needed to manufacture the final product The W.I.P.(Work-In-Process) is the best indicator of flow discontinuities.

Definition:

"W.I.P. in time units"					
"Lead Time"					

Value	1	2	3	4	5
Range	3	2	1	0.5	0

- **p8 to p10 - Stocks Ratios: Measures** the level of stocks needed to be used to cover the problems of synchronism.

Definition:

"Stock in time units"					
"Lead Time"					

Value	1	2	3	4	5
Range	2	1.5	1	0.5	0

5. THE BENCHMARKING: DATA COLLECTION AND CONCLUSIONS.

parameters	Product businesses																	
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18
p1	3	4	3	3	5	4	5	3	5	5	4	1	4	5	4	5	4	5
p2	3	4	4	5	4	3	5	3	5	5	4	5	4	5	5	5	5	5
p3	2	5	5	5	4	3	5	4	2	4	4	3	3	5	2	4	3	5
p4	2	3	3	3	3	2	1	4	3	3	3	3	1	3	2	4	3	3
p5	4	4	4	5	4	3	3	3	5	5	3	3	3	3	3	3	4	4
p6	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	4	3
p7	2	3	1	2	1	3	2	3	4	3	3	2	3	1	3	4	3	3
p8	4	1	1	1	1	1	1	5	1	1	1	3	1	2	1	4	4	4
p9	1	1	1	1	1	4	1	1	1	1	1	1	2	1	1	1	1	3
p10	1	1	1	1	1	1	1	1.4	1	1	1	4.5	1	1	1	1	4	4
Total	25	27	24	27	28	24	24	27	27	28	24	27	23	27	23	31	38	39
Lead Time (days)	6	1	3	2	1	6	10	14	0.75	0.5	5	5	1-3	1	1	2	5	5

(fig.3)

This data (fig. 3) were collected in selected 18 product businesses in 17 companies of the Home Appliance Cluster. The procedure for data collection was as follows:

- A presentation of the key parameters was scheduled to the General Managers
- Half a day was spent in each product business. This time included:
 - A visit of the shop floor to get a real view of the production process.
 - A meeting with the product business manager and with the General Manager of the Company

(Fig. 2)

The average time spent in each product business was 1 day/person. and the information collected was very useful in the discussions to define the global strategies to prioritize the set of actions and the expected benefits. Figures 2, and 5 show one example of the graphic used for communication purposes, one example to see the kind of actions defined (after more detailed data collection) and expected results. Finally the figure 6 makes a summary of the main conclusions.

Improvement actions		EXPECTED IMPROVEMENTS						
		Resp.	Lead	Waste	m2.	WIP	Stock	Labor
1	Cleanness							
2	New management of the buffer n.2							
3	Redesign of the machinery area:							
4	Redesign the final assembly							
5	Set-up improvement in the die							
6	Improve flexibility (in the							
7	T.P.M. plan in critical machines							
8	Improvement of critical suppliers							
Improvement Potential			30 %		30 %	40 %	40 %	30 %

(fig. 5)

Conclusions:

MAIN CONCLUSIONS

- The defined parameters proved to be useful to know the distance to the "lean production ratios" .
- Rapid diagnosis and assumption of the real priorities to invest. The analysis allows the use of parameters easier and understandable to manufacturers.
- Rapid launching of improvement programs.
- Very useful as self diagnosis-tool (In current use)