

WHAT BEYOND LEAN?

1. Abstract

The paper describes the technological leap beyond lean practices specially for the one of a kind and short run series of complex high added value products.

The implementation of lean manufacturing principles gives more easy way to extensive technological dominion of the factory. This technological dominion has some components that are described for the physical systems (tooling-handling-machinery) and for the extreme tight flows real-time operations (intelligent software).



2. Now lean has reach maturity. This means that a wide spectrum of companies have finally lead successful implementations in terms of significative and sustainable gains.

Sometimes radical, sometimes “justock”, productivity of human resources and assets, and lead-time reduction have been evidenced.

Yet some activities resist. OKP (one of a kind production) and MRO, and in general very short runs of engineered high added value (EHAV) items⁽¹⁾. Special features for the successful application of lean in them were experienced by Sisteplant, with EADS, AIRBUS and others, in the recent past and even in those days. We need focus such as:

- 1) “virtual cells”
- 2) “lean in design and product/process/supplier engineering”.
- 3) blended visualization of physical and intellectual milestones along WIP.
- 4) plant rapid response teams with engineering capabilities, and
- 5) ICT based reactive real time integration of the supply chain with associated engineering decisions.

But the special difficulties along the activities of OKP–MRO–EHAV will vanish as soon as some key pilot projects convince mainly middle management that no other ways exist to reconvert the existing ageing manufacturing practices⁽²⁾ It is a matter of time with good results; for a plant of some 500 to 2000 people, let two years, no more.



⁽¹⁾ The niche for the European industry in the future

⁽²⁾ Eastern countries are a very serious contenders, even for EHAV.

3. And beyond...

Refinements of lean principles, for as different as they seem to be in these particular applications are a substantial part of it. So, that is not what we have to work out for radical differentiation in the way we'll manufacture the next decade.

Counting extensive people motivation with the aesthetics and efficiency of tight-flows and, needless to say, very well trained in technicalities and single management practices, we must be dauntless for the next. ¿How could an industrial organisation be different?. The challenge is quite evident if we think over from the mentioned “very improved” arena: promote real-time intelligent “Xgrade” automated actions (RTIXA). Where?: in tooling, in machinery (processing), in handling, in reactive scheduling of the plant and associated engineering and supply – chain activities.



3.1. RTIXA in tooling, handling and machinery

A very promising field, Sisteplant branch Goldgym is investigating in the adaptative – intelligent tooling for moulding carbon-fiber composite parts for the aerospace, along with complementary assembly devices.

Other interesting area addressed in the BAIP2020 (Astilleros de Murueta – Sisteplant CENIT project), is the new concept of shipyard assembly systems involving also intelligent-adaptative large manipulators and beds.

RTIXA here chases for no set-up times, and long life tooling and handling systems with evolving products. Machinery evolution will mainly be in adaptative robustness and intelligent fault-tolerant corrections for the more than 6Sigma “first stroke” need.



3.2. RTIXA in reactive manufacturing

Scientific – optimized preventive and corrective maintenance of sophisticated equipment, and transparent – sounded – agile alarms triggering and allocation in the materials extreme tight flows, are the more convenient areas for the application of RTIXA in production management.

The interface with humans here is crucial, and so, focus essential. Sisteplant has experimented and “built-in” in its MES – CAM systems Captor 3[®] and Prisma 3[®] an original (“Eventrack”[®]) system which employ the “significant events” as the pieces of information to be comprehensively handled by shop-floor and staff people, progressively increasing the “Xgrade” of automation in the derived actions.

But the most powerful meaning of “Eventrack”[®] is the technological training it gives to both existing and new recruited people as a continuous base. A comprehensive way to see the usually intricated unexplored technical data-bases is provided through an event – driven exploration at successive detailed levels. Not to say that the computer-aided actively promoted technological training of people in the machinery-tooling and scheduling troubleshooting is a significative lever for motivation and competitive culture building, and so important, for the achievement of more than 6Sigma in the critical manufacturing processes.

4. What for all that ware?...

What is needed to compete will become extreme. Particulary we will need extreme agility (KPI = $\frac{\text{Added value time}}{\text{Lead time}}$) and extreme quality at the source, with 6Sigma and more in the critical manufacturing processes of OKP-MRO-EHAV.

The KPI leads also to very high productivity of the –today differentiated- direct and indirect labours, and more than 6sigma “built in process” means mainly a best-unreachable class of well designed quality products (long-life coherent with the eco-way).



5. Conclusions

Next-gen manufacturing systems will radically divert from current's. Extreme agility and quality over long-durable best in class products and techno-high motivated workforce, have to crystallize at the same time in a coordinated way. The ability of designing and cleverly implementing integrated RTIXA systems, specially for the OKP – MRO – EHAV in the aerospace, defence, transport and automotive sectors will allow to not only maintain, but develop a renovated European advanced industry.

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