

# BEST PRACTICES IN COIL MANUFACTURING

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Abstract: Keeping up with customers' ever increasing wants - on-time delivery, better quality, lower cost, reduce cycle time, smaller size - is a daunting task. It is not different in Coil Manufacturing except that, it may be even more challenging. The organizations' own internal personality and discords make the situation super dynamic.

Can doctor afford to give up when faced with a difficult patient having multiple diseases? A good doctor relies on best medical practices instead and, *uses them* to treat. Like wise, there are best magnetic manufacturing practices that come to a rescue. Benefit from presenter's hands on experience to gain insight into the best manufacturing practices.

Actual case histories presented highlighting the best practices used and the results achieved.

Key Words: Coil Manufacturing, Best Practices, Magnetic Manufacturing Practices, Lean Manufacturing

## INTRODUCTION

Every time I have asked a customer "how can I help? Or what can I do for you?" the answer is always the same; on-time delivery, better quality, lower cost, reduce cycle time, and smaller size.

And now in the 21<sup>st</sup> century, the customer is also demanding suppliers to provide technical and engineering support for the products they are buying!

What's more!

For the manufacturing group, difficulties abound! Internally it does not get any help either. The designers raise their hands "Product designs are already marginal, there is no more room". The marketing and sales keep repeating, "There are other suppliers knocking on the doors with lower prices. If we don't respond, we loose the business".

And manufacturing feels, Poor Me! .....the buck always stops here!!

What all these mean to manufacturing and what can it do?

While it should constantly battle with the design and marketing/sales to get the cooperative help, it must work

internally to excel in developing the best manufacturing practices to safeguard their own interests and that of overall business.

As it goes, the charity begins at home.

And to that end, I am going to talk about developing and implementing the best manufacturing practices in Coil Manufacturing. The practices those are resilient enough to handle day-to-day smaller bumps and troughs and, are also able to adjust to greater market dynamics. I am going to draw upon actual case histories to illustrate.

## CASE HISTORIES

### Reduction of line shortages to nil:

Shortage of Mangetic Coils on Ballast production line became a chronic problem. It was systematically was reduced to nil.

Best Practices used: '*huddle*' meetings at the start of each shift; setting *clear goals* of the production schedule for the shift; assigning clear *responsibilities*, *empowerment* for quick resolution to the short term problems; *agreement* by every participant of meeting the agreed upon production schedules; timely *communication* of issues; *team work*; holding *accountable*; *urgency* of production and, in turn of customer satisfaction; built in *factor of safety*.

Results achieved: shortages reduced to nil; happy customer; reduced inventory; improved confidence for on-time supply; timely communication to customer in case of unavoidable problem in meeting scheduled production; trust built; cooperative working among all concerned departments; improved team work; short-term and long-term issues surfaced and tackled separately improving overall manufacturing efficiency.

The format of the 'huddle' meeting, length of the meeting, the mandatory participants, items of discussion, role of the leader, difficulties encountered in implementation and how they were handled and other details were charted out clearly to begin with; and continuously find tuned for effective implementation.

### Replaced existing Output Transformer with easy-to-manufacture design without interruption of production:

Manufacturing was producing the transformer that was not 'designed for efficient manufacturing'. The welcome

changeover to easy-to-manufacture transformer was implemented with seamless phase-in phase-out without altering its foot print.

Best Practices used: Going *back-to-basics*; *systematic approach* to product redesign and qualification process; *team-working* with design engineering; *optimizing design* to meet needs of both -design and manufacturing; *trust building*; developing manufacturing *capability studies*; developing *manufacturing rules and guide lines* for design engineering to use; *selection of a leader* and his/her unbiased role; *seamless phase-in phase-out* change over;

Results achieved: Redesigned transformer that was 'designed for manufacturing'; win-win solution making all troupes happier; decreased manufacturing cycle time; increased electrical safety; improved understanding of design needs by manufacturing personnel and manufacturing needs by design engineers; improved information sharing and working relationship; trust built; long term relationship developed.

An engineer knowledgeable in coil design and its manufacturing was assigned the project. Empathetically he brought design engineer and manufacturing personnel across the table. Design changes and manufacturing process changes were made and implemented that were agreeable to all. The individual goals of design and manufacturing were achieved amicably. Working with appropriate personnel across the organization, the change over was implemented seamlessly.

## BEST PRACTICES AND A WAY TO IMPLEMENT THEM IN A DYNAMIC MANUFACTURING ENVIRONMENT

The best magnetic manufacturing practices encompass multi-disciplines and their inter-dependencies. The areas to constantly addressed are:

- Developing in-house manufacturing capabilities and sharing them with design engineering; includes preferred core and wire sizes to use, desired wire routing, preferred bobbin sizes, winding patterns, termination preferences, manageable fill factors.
- Create 'check list' for sign-off for accepting new design and design changes prior to going into full production. Includes product specifications (mechanical and electrical), test requirements, safety information, documentation.
- Training new employees
- Process Control & Continuous Improvement for quick change over and lean manufacturing
- Material Control and Inventory Management for cost control

- Process development for efficient flow and optimized automation
- Floor layout for flexible manufacturing and efficient material movement
- Continuous learning from operator experiences
- Scheduled maintenance and faithfully following the schedule
- Up-to-date Documentation
- Continuous Quality Control; empowering for stopping production if necessary
- Cleanliness
- Operator safety
- Cost control – mechanism to capture real time direct, indirect and fixed cost
- Team-working internally; empowering, quick resolution to line issues,
- Team-working externally with Design Engineering, Supply Management, Production Scheduling, and Customers
- Outsourcing; keeping an option open for keeping in-house manufacturing efficient and honest!

### Implementation Guidelines:

- Accept the fact that external dynamics of the market and customers is going to be constantly there and so as dynamics of the internal design changes and sales pressure.
- Accept the fact that getting any help and relief from Design and Sale/Marketing is going to be a constant battle.
- The charity begins at home by organizing and maintaining the house with the best practices in each discipline. That would lay a good foundation to handle the minor bumps and troughs that invariably come almost daily. For major changes, normally there is a reasonable time to respond and, again clear understanding of your own capabilities and good team-working and trusting relationship with the rest of the world would help tackle them.
- Always there are things that are in your control and some that are not in control. Know which are and which aren't. For the things that are controllable, put your best efforts, via structured processes and procedures, with safety-guards to keep them in check. They should become part of day-to-day routine rather than emergencies. Only those things that are not in control should become emergencies. Make sure that such emergencies are not more than those that can be handled with given resources.
- When setting up manufacturing from scratch, there is a room for using all the best practices to begin with. And one should take full advantage of it. However, even in that, chances are that customer needs the new product

in such a short cycle time that there may not be enough time to implement all the best practices one would like to. It forces to get into production quickly with reasonably well design coil that is satisfactorily functional. The improvements are left for future....and there you go! Using Best Practices is *the* answer!

## CONCLUSION

The market place dynamics are inevitable and constant. Customer expectations are ever increasing. With ever-increasing globalization, stay ready to face even greater dynamics of the 21<sup>st</sup> century. Charity begins at home – use the best manufacturing practices available to stay on top. Using the best manufacturing practices is not a ‘want’ anymore; it is the ‘need’.

Samir Kagalwala has unique combined experience of manufacturing and design of Wire Wound Components in Power Electronics. He brings over 30 years of experience in bridging Design and Manufacturing of Wire Wound Components for improved products and customers’ satisfaction. He has resolved short term and long term issues meeting internal and external customer needs. He developed design rules and guidelines for manufacturing and helped increase manufacturing professionals’ understanding of the design criteria. His experience also includes feasibility studies, supply management, costing, and project management. He worked for Philips Electronics, Motorola and Zenith Electronics in various capacities. He holds MBA from DePaul University, Chicago, B.S. in Electrical Engineering and B.S. in Mechanical Engineering. At present, he is a chief consultant at San Diego based Power Magnetics Consultancy (PMC).

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