SAFETY

Modifications on production lines: what is their impact on safety, quality and efficiency?

It's called Change Management, and concerns making modifications on machines and plants, but also on production modes, etc., maintaining full control of the process in order not to incur in unexpected problems of any kind. The theme is delicate and stimulating and it is extremely relevant. Indeed, the general crisis and overproduction situation in the continental tissue field has led companies to make a series of strategic considerations that render modification interventions particularly important, to the detriment of the purchase of totally new machines.

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The strategic considerations are elementary but they have an important impact on the development of investments:
a) the importance of marketing, i.e., of the continuous evolution of the products' image and characteristics, tells us today that those who are not active in the "innovation" aspect of a product are destined to have to leave the market. And - given the general situation of overproduction - leaving the market today may mean never getting back in;
b) there are no financial resources available for large investment plans. So innovation must be pursued by spending as little as possible.
So, if we exclude large investments in new plants or machines, there is only one road left to take: modifying existing machines and plants.

THIS STRATEGY, THAT HAS A WELL CONSOLIDATED LOGIC ON CERTAIN TYPES OF MACHINES (PMS, REWINDERS, ETC.) CHARACTERIZED BY HIGH COSTS, longer amortization times and also a certain technological stability, is becoming more and more frequent in the converting field, too, where today, also the large industrial groups are adopting the strategy of updating their existing machines through the addition of new units, replacement of existing units or by making even minimal modifications that render the product more appetizing to the market.

ALL THIS HAS A VERY REASONABLE INDUSTRIAL AND STRATEGIC SENSE, BUT IT ENTAILS SEVERAL ENGINEERING AND NON-ENGINEERING PROBLEMS, TOO. Modifying a converting line, and hence mixing units having different "ages", often featuring different technologies (even if we remain faithful to the same manufacturer) is a little like putting a new patch on an old dress... Some problems in "fit" are bound to arise. This is, of course, all the more true for very complex machines (or lines, if you prefer) while it instead carries less importance for machines that are placed one after the other (for example in the packaging area) but perform totally independent process tasks.
Of course the enhanced interest for updating existing machines in lieu of investing in new production systems entails that, engineering-wise, the manufacturers themselves keep this fact into account in order to be able to best preside over an important market. So the strictly technical issues are resolved in concert between the user - who knows the product objectives to be pursued - and the manufacturer, who has the capability to intervene, keeping all the technical constraints in mind.
But this is true for the more substantial modifications. There are also micro-modifications for which the user performs a prevalent role also under the engineering aspect, although he may use outside suppliers for the purely executive aspects. Here, sometimes, problems may arise that can be resolved with a good dose of patience.

SPEAKING OF STRICTLY TECHNICAL PROBLEMS AND PROBLEMS CONNECTED TO GOOD OPERATION, we have implicitly asked ourselves a question that must guide every modification designer: is the modification feasible and will it lead to the desired results? Evidently we feel that this question must have come to someone's mind and that the answer must have been affirmative. But is it always so? And also: is this the only important question to ask?
Let's proceed with order. There is a branch of safety engineering (and not only) called Change Management that aims at giving a logical thread to the management of modifications - large or small - made to machines and plants. The basic idea is to consider every aspect before undertaking an actual
executive project for a modification so as to avoid delays, unexpected costs or even failure with respect to the objectives sought.

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The logical flow is hence the following (and we invite the reader to ask himself if he follows all these phases, at least mentally):

1) EXACTLY DEFINING THE GENERAL SPECIFICATION OF WHAT MUST BE PRODUCED. For example, adding a contest participation card inside a package of toilet rolls; or going from 2-color printing to 4-colors. It may seem banal, but especially for minor modifications, the anxiety to make these quickly is so great that we often jump to the solution without considering other alternatives. Let's add a further consideration: recently, even in the world of tissue, approaches to quality based on Japanese logic such as TPM (Total Productive Maintenance) and similar systems are insistently making headway. Personally speaking, I cannot deny the potential for involvement of these methodologies. I would like to limit myself to pointing out that due to its very nature, TPM generates an incredible number of micro-modifications to production systems aimed at increasing efficiency (by reducing micro-stops) and reducing waste (by making improvements that eliminate or reduce small defects). These modifications, too, that are sometimes "closed" within the production department (from the idea, to the authorization, to the actual realization) must be managed through a controlled process.

2) PASSING FROM THE SPECIFICATION TO DESIGN IDEAS IN ORDER TO THEN BE ABLE TO ASSESS FEASIBILITY AND EFFECTIVENESS. It is better to always compare the different alternatives, while instead the process that we habitually follow is to consider one solution, assess only that solution, and only in the event of some sort of problem do we research other possibilities.
Of course, this is not always so: many of the more experienced design engineers assess more competitive alternatives "in their own heads", but they do not keep track of these and so right from the beginning, colleagues and subsequently also the more expert design engineers themselves, are not in the position to know what was really considered and the reason why certain propositions were discarded.
The lack of traceability entails that, if we must trace the design flow backwards, a large portion of the reasoning process has to be repeated.

3) COMPARE ALTERNATIVES KEEPING ALL THE IMPORTANT ASPECTS IN MIND: compliance with the specifications, cost, simplicity of realization, etc., but also safety and environmental impact.
And these latter aspects are actually the most delicate ones, not so much in their substance as much as due to the fact that they are often taken into consideration when the execution of the modifications is already under way. And this may entail problems in the form of reworks, extra-costs not contemplated in the budget or even problems that may prevent the completion of the modification project.

4) AT THIS POINT, ONCE THE SOLUTION HAS BEEN CHOSEN AND ITS FEASIBILITY AND SUITABILITY ASSESSED, THE DESIGN PROCESS FOLLOWS THE TRADITIONAL PROCEDURE, side by side with a risk assessment activity, the extent of which is determined by the type of modification to be made. For small modifications that do not affect the general performance or the intended use of the machine, the assessment must refer exclusively to the object of the modification; otherwise, it must concern the entire machine.
In the European Community, the latter consideration is dictated by precise dispositions contained in machine directive 2006/42/CE, but technically, it is valid everywhere. Indeed, if a modification concerns a limited portion of a machine, evidently the rest of the machine is not affected and hence its safety conditions will not change. If, instead, the modification alters a fundamental design parameter of the machine (for example the speed of a roll converting machine) it is clear that we must assess that this intervention does not introduce "problems" on the machine as the whole. The same issue is true also for what concerns aspects of environmental impact or energy efficiency, if relevant.

5) THE SUBSEQUENT PROJECT DEVELOPMENT AND VALIDATION STEPS ARE MORE OR LESS INTENSE BASED ON THE TECHNICAL COMPLEXITY OF THE MODIFICATION, but it is not worth it to list them here. Instead, let us go directly to the last step of this process: the so-called check-out. Why "so-called"? Because what we want to describe here is not only the "contractual" check-out between two different functions - design/manufacture (internal or external) and production, a check-out that would serve to assess if what has been produced complies with the agreed specification. But it is also a validation of the risk assessment activities (for people, for the environment, etc.) that accompanied production. By validation we mean not only a verification that everything has been done as per the project design, but also that the safety objectives have been effectively attained.

IF THE PROCESS IS THE ONE BRIEFLY DESCRIBED ABOVE, WE MUST ALSO CONSIDER SOME COLLATERAL - but certainly not less important - aspects. First of all, defining a project does not mean bringing it to fruition, because we have

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to establish who takes responsibility for the various logical stages and who makes the related choices. So, besides knowing what has to be done, it is necessary to univocally define the process to be applied and designate who must perform the different stages, in particular
those inherent to safety and environmental protection.
We must keep into consideration that the person in charge of these aspects assumes serious technical and moral responsibilities, so it is important to attentively consider the competencies and capabilities of the persons to designate.

ANOTHER ASPECT TO CONSIDER ARE REGISTRATIONS: in a field where modifications (small ones, in particular) are almost a daily occurrence, it is fundamental that what is engineered, assessed and produced be recorded.
Otherwise the concrete risk is to lose sight of what has been done, why it was done, and the reasoning behind the assessment of the conditions of safety.

ANOTHER RELEVANT POINT: WHAT REFERENCES SHOULD BE ADOPTED FOR SAFETY? We are speaking of safety in particular because it is probably the most complex aspect to be kept (properly) under control in the tissue field when making modifications to the machines. Indeed, in this field, the machines - both at the paper mill and in converting, present very significant sources of risk for operators and maintenance technicians that in the course of the years have caused numerous accidents, even very serious ones. So, each time a modification is made, it is very likely that its safety aspects are affected in one way or another.

FOR A GENERAL AND VALID DISCUSSION, WE CAN TAKE THE EUROPEAN LEGISLATION AS EXAMPLE. The basic concept of the EU directives on safety in the workplace and on product certification (CE marking) is that those in charge of the operation of a machine or plant must, so to speak, enact safety improvement measures starting from those currently adopted. That is to say that the user, although having to keep the technological evolution of the safety aspect in mind, can adapt only within the limits of possibility, and in any case without ever putting machine design into question. Instead, those who design - and, analogously, those who make modifications - must adapt to the state of the art to a much larger extent. This is true in particular if the modification is so meaningful as to affect the machine's design parameters.

THIS IS A CONCEPT THAT CAN TAKE ON A GENERAL VALENCE. THOSE WHO, THROUGH MODIFICATIONS, ACTUALLY INTERVENE ON THE MACHINE'S DESIGN MUST ASSUME THE RESPONSIBILITY OF A NEW ASSESSMENT ON THE SUITABILITY OF THAT DESIGN. Of course we cannot expect that an existing machine attains the safety levels of a new machine, but this is what we should aim for. In any case, it is unacceptable that a modification reduces a machine's safety level.

WE CONCLUDE, AS ALWAYS, BY TRYING TO SUMMARIZE. Modifications must be managed based on a controlled process for which responsibilities have been clearly defined. This process must guarantee that safety aspects for the workers (operators and maintenance technicians) and environmental protection aspects are taken into consideration adequately in advance in order to avoid reworks, legal non-compliances, etc. The breadth of this analysis is proportionally dependent on the impact of the modification that we want to make. The technical references for the aspects of safety are those defined by the state of the art, even though such references must be mediated by a strong dose of good sense on a technical/engineering level. •

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