

PROJECTS RETROFIT ECONOMICAL REVITALIZATION OF SWITCHGEAR

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SUMMARY

Projects RETROFIT enable economical revitalization of the obsolete switchgear up to 52 kV for indoor installation. If the costs prove justifiable, the projects give the best technical solutions. At the same time projects RETROFIT enable carrying out of modernization in service, because the replacement of withdrawable parts can be performed without putting almost all switchgear out of operation. According to experience, this expense is about 40% of the cost of a new switchgear. The new operating life is practically the same as of a completely new switchgear. After revitalization is finished, production, settings and testing are done according to IEC recommendations and JUS EN ISO 9001 2001.

1. INTRODUCTION

The old dilemma “when and how to invest” is present in all segments of the economy and societies of the most developed countries in the world, and not only in the production and distribution of electric energy. There are newly developed and applied methods of watching the reliability, costs, availability and other parameters which characterize the functioning of isolated equipment and technological. In our process industry and electrical industry this question is not given a proper care, we work “ad hoc”, do not use available resources, although our country is labelled as underdeveloped and poor. The purpose of this survey is to make a wide circle of users familiar with the idea of the project RETROFIT which is applied all around the world, and which was realized in our country in the period from 1991 to 2005 in the parts of the switchgears of their own consumption, such as TE Kosovo, TE Nikola Tesla, TE Morava, in the block “Crvena Zastava”, The foundry in Ralja, Aluminium plant Podgorica, etc.

2. PROJECT RETROFIT

2.1 What the owner does – METHODOLOGY.

According to the available data from the first putting into operation, the owner can easily and reliably establish (unless it is already done according to the system in the organization) and to perform the annual:

- Analysis of the costs of repair/replacement/ of switchgear elements
- Analysis of the non-availability of a switchgear (or its elements)
- Analysis of direct and indirect damages
- Estimate of the possibility for the switchgear parts and components to stop working
- Analysis of the level of the applied technology in relation to the switchgear demands

According to the said above, at the given time, FEASIBILITY STUDY (diagram 1) of the investment can be performed:

- a) a new investment
- b) revitalization of the existing switchgear

The tools for the above analysis and estimates are well-known and they will not be mentioned in this survey.

If we rationally suppose that feasibility study proved that revitalization is justifiable and if we consider that switchgears are usually:

- In a very good mechanical condition
- In an acceptable state of surface protection
- With the dimensions suitable for maintenance
- With the equipment for measuring, protection, signalling and control which is technically obsolete, and which does not correspond to modern demands
- With the satisfactory skill level of the personnel from exploitation
(it is also supposed that technological and technical skill of the operation and maintenance personnel is satisfactory) , the project RETROFIT can start.

2.2 What the performer does – RETROFIT

2.2.1 Retrofit of draw-out cubicles.

Modern design and technology of the elements of medium-voltage switchgears means much better technical parameters, higher reliability in the operation, easier managing, longer period of revision. The core of every switchgear are switching devices, the equipment for protecting, measuring and signalling. Today, users are in a position to have extremely qualitative so-called switching devices “maintenance free” in SF6 or usually vacuum technique, as well as integrated multifunctional micro processor based devices for controlling, protecting, measuring and control a switchgear. (picture 2)

Dimensions of modern switching devices enable their easy adapting and inserting into “old” switchgears (cubicles). Most producers can simply replace the section for protection and secondary equipment with the new one which is completely finished and tested in a factory, and can be inserted on the spot (which is the fastest way), but also the existing one can be used after being repaired.

A great advantage of RETROFIT is the possibility of its realization without interrupting the work of the complete switchgear, since the main work is done on draw-out parts.

While retaining the unchanged geometry of the main electrical circuit of the fixed part of a cubicle (so-called fore-cubicle), as well as retaining the basic system of operations and interlockings, it is very simple to build every switching device in a draw-out part. Secondary electrical circuits are also easily adapted to the original ones using connector. According to the estimates of technical condition, the replacement of remaining heavy equipment is possible.

2.2.2 Retrofit of fixed cubicles

This part of the Retrofit project includes essential changes on obsolete switchgear which mostly have big dimensions, and this enables easy realization.

The change is based on the insertion of a complete draw-out module (which is a part of the metal-clad cubicle) in the cubicle which is being revitalized. The draw-out module replaces all switching equipment of the existing cubicle: bus bars disconnecter, circuit breaker, exit disconnecter and earthing bar. (picture 3)

The arrangement of main bus bars and places of cable connections would remain the same.

Inserting the micro-processor device for protecting and control into the existing one or into a new low-voltage cubicle we would get a modern cubicle which would be completely in accordance to the latest

solutions in the medium-voltage domain. Applying the concept one cubicle – one device would enable easier and modern remote control.

2.2.3. Retrofit of low voltage switchgear

Revitalization of low-voltage switchgear is also possible, whether they are switchgears with draw-out or fixed equipment.

Switching equipment of the new generation has smaller dimensions than old devices, so their easier insertion is possible. As for the fixed switching devices, it is possible to insert switching devices in the draw-out version, which would considerably improve the quality and reliability of the switchgear. All this is followed by a larger choice of protections and the possibility of remote control.

2.2.4. Design (“as-built” design)

Making a pre-design (making the control and wiring diagrams) is done according to technical and technological demand of the consumer.

The base of making a pre-design consists of:

- existing documentation
- recording of the existing condition
- new demands of the consumer, related to protection and control

Replacement of small equipment in low-voltage cubicles is recommended (miniature circuit-breakers for protection, accessory relays and terminals), because their part in the total cost is small, and this improves the quality of the object and of the very project.

According to this, the making of new control and wiring diagrams is performed.

Once the operations, checking and putting into operation are finished, possible changes are included into the documentation and the making of project of the derived object which is authoritative for exploiting and maintaining of the reconstructed switchgear.

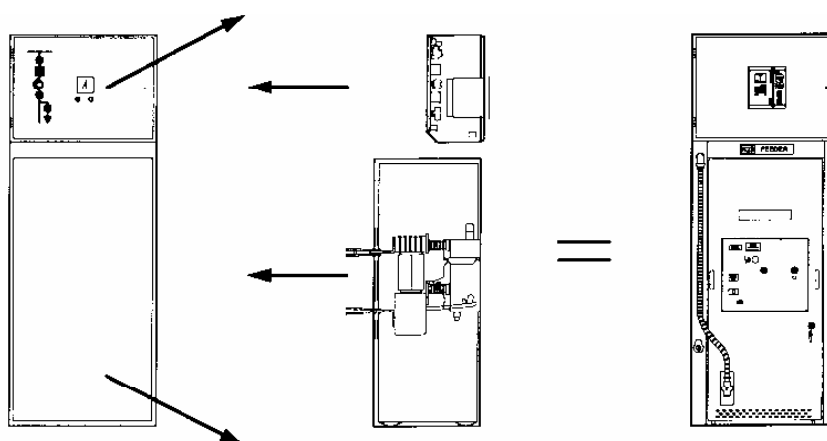
2.2.5. Checking and putting into operation

After finishing the operations, testing of elements which were the subject of the operation starts. The performer is obliged to give checking sheet, testing documentation according to the IEC recommendation and JUS ISO 9001/2001.

The author suggest that the project RETROFIT should be realised as “ turnkey”.project

Depending on the volume of the projects, the new “old” switchgear has a servicelife like a completely new one, while total costs does not exceed 40% of a new switchgear.

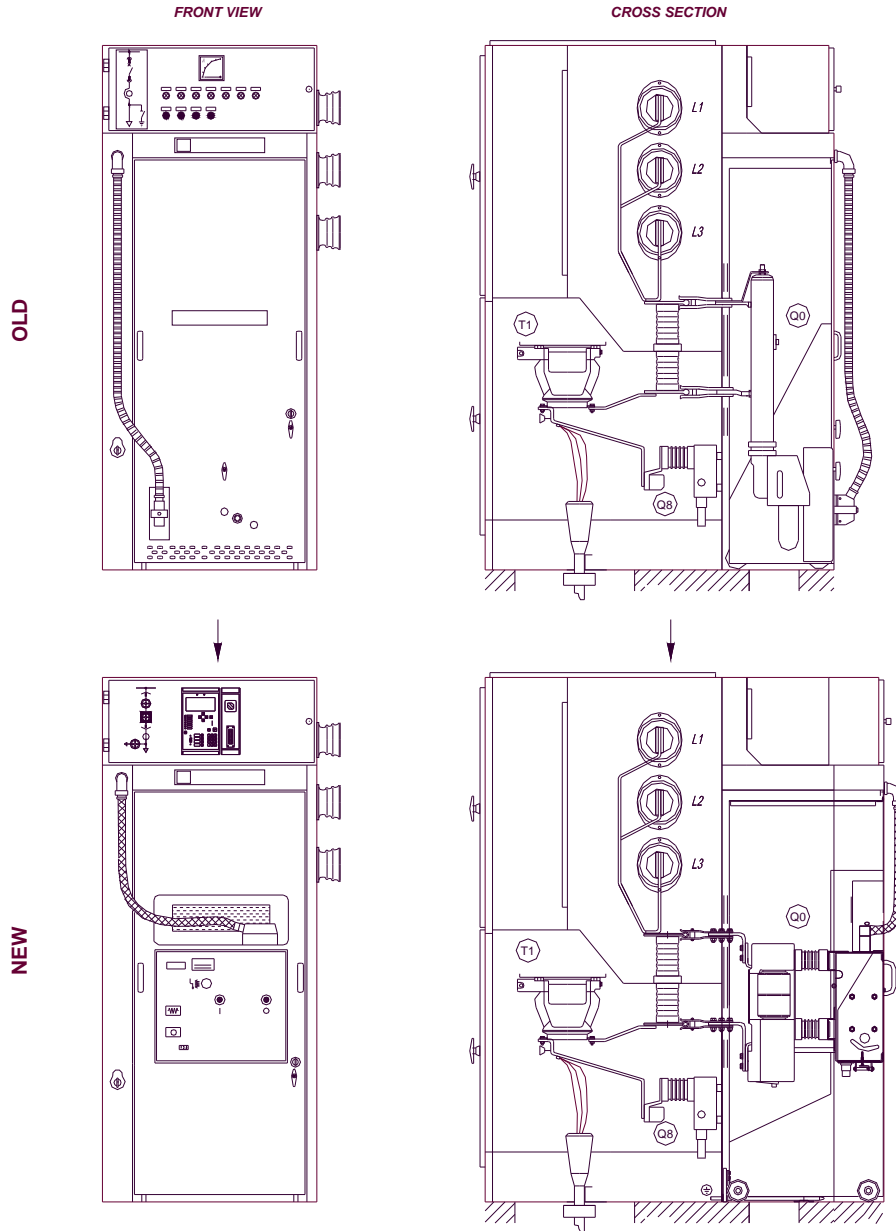
Diagram 1 shows a basic block diagram of the access to the activities during the realization of the project.



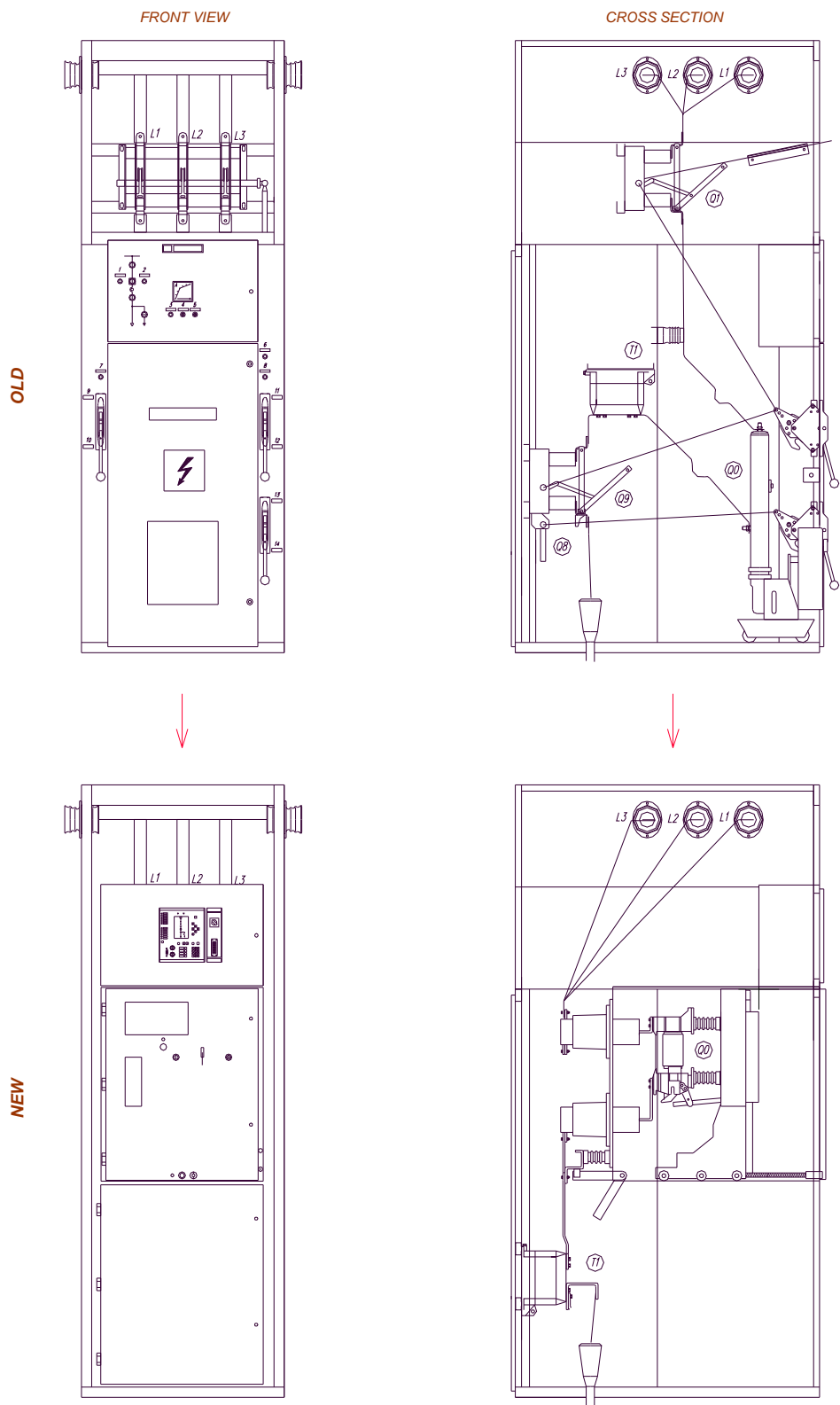
Picture 1 THE PRINCIPLE OF RETROFIT

CONCLUSION:

- RETROFIT project is an economically justified and very rational demand
- The project is applicable to all draw-out equipment, and as well to fixed switchgears
- Realization is fast and does not need putting the switchgear out of operation
- Dimensions and geometry of the main electrical circle are not disturbed
- Replacement of the equipment in the secondary equipment part, or of the whole part is easily done
- Secondary wirings are simply adapted
- Service life is as of a new switchgear
- Vital test documentation is issued for all vital parts
- Total costs of the project realization do not surpass 40% of the cost of a new switchgear



Picture 2 RECONSTRUCTION OF DRAW-OUT CUBICLES BY ADDING A PRE-SPACE



Picture 3 FIXED CUBICLES RECONSTRUCTION

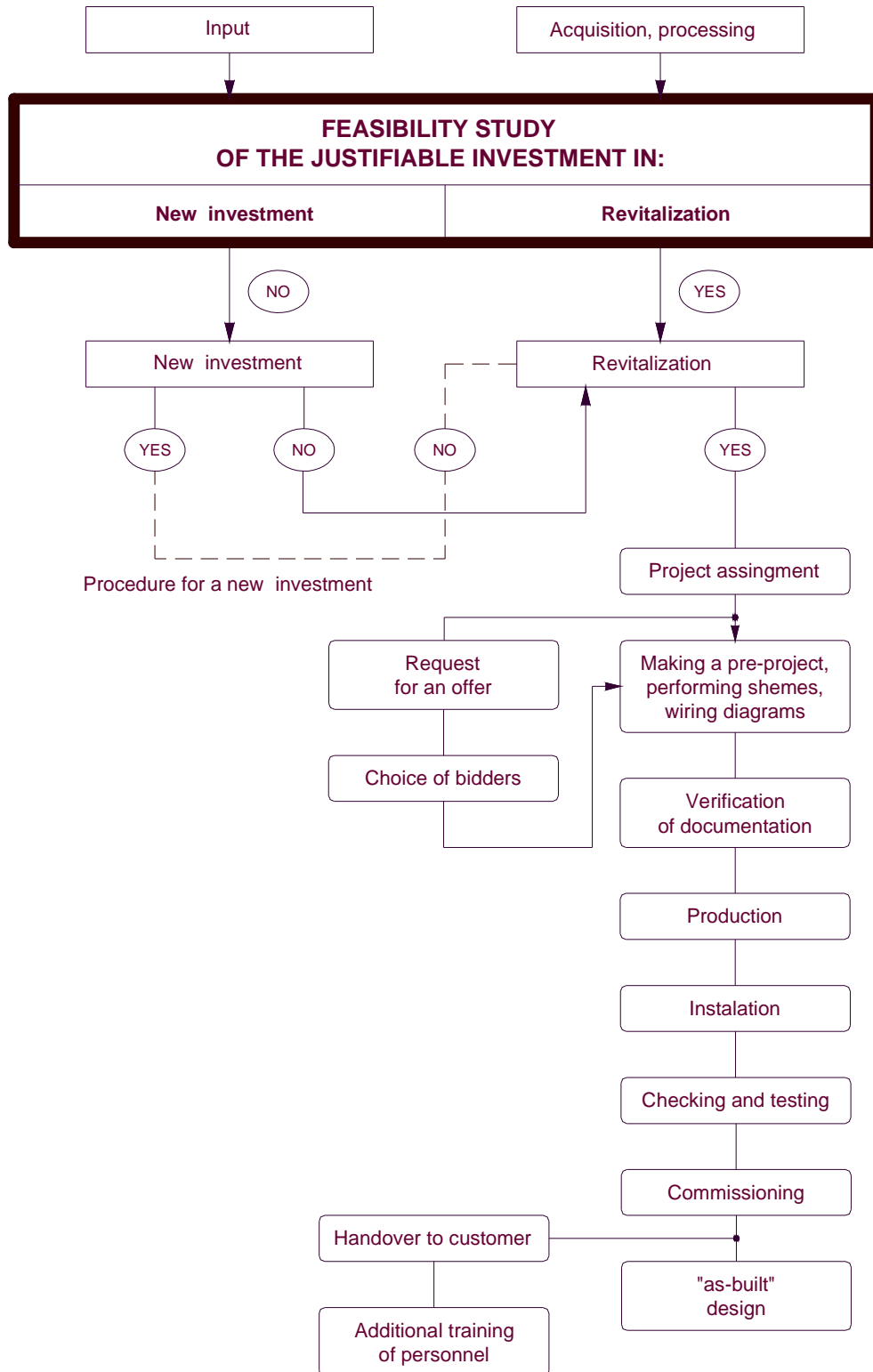


Diagram 1

BLOCK DIAGRAM OF THE ACCESS TO THE ACTIVITIES DURING THE PROJECT REALIZATION RETROFIT ("TURNKEY" PROJECT)