The bright people for the job

ENGINEERING – ORGANISATION – TRACTION
Competence, enthusiasm, excellence

With these qualities, applied daily over many years, we have earned the confidence of our clients in Britain, Switzerland, and many countries world-wide. Infrastructure owners, operators, public authorities, manufacturers, engineering firms—all value ENOTRAC’s independence and efficiency.

Railways and public transport is our field of activity: Rolling stock, power supply, signalling. From tendering to maintenance, planning through to execution and testing, electromagnetic compatibility to safety cases. Multi-disciplinary assignments are our strength, supported by powerful software tools developed by ENOTRAC’s engineers and specialists. All tools are based on technical experience on real projects and have been validated by extensive measurement campaigns.

Competence is our foundation. Domain-specific competence and solid engineering know-how, coupled with a wide practical experience. Equally important, is our human competence. To listen, to understand our client needs and aspirations. Flexibility to find the right approach in challenging situations and projects. Openness to work successfully and in harmony with project teams, often in multi-player, multi-national, multi-site settings.

Nothing great was ever achieved without enthusiasm—so goes the famous quote. The enthusiasm of ENOTRAC staff is unmistakable, not only for railway engineering but also for challenges. For us, job satisfaction is important, as is the pleasure of collaboration with our clients and partners. Our long-term relationships with clients is proof that enjoyment can indeed go hand in hand with professionalism and efficiency.

Excellent performance is our aim. Outstanding, yet always in touch with reality. We apply innovation, yet respect and use available experience. We strive for elegant and forward-looking solutions. These ideas are vividly expressed in the design of our brochure by the artist Martin Eberhard. Let yourself be carried away by the fascinating combination of art and technology.
**Vehicle engineering**

Modern rolling stock – high technology on wheels – is designed for a long service life under extreme conditions.

Making the right investment in such capital-intensive assets is largely determined at the procurement stage. ENOTRAC offers railway operators solid support ranging from the preparation of specifications according to national and international standards and regulations, to the objective evaluation of bids, through to design review and the acceptance of rolling stock. We have successfully accomplished small and large assignments, including numerous calls for tender by Swiss private railways and, internationally, the approval of the traction equipment of the Shuttle locomotives for Eurotunnel, and the acceptance of the trains for the Bangkok Metro.

Engineering is our core business. We can provide concrete technical solutions to vehicle manufacturers ranging from, to mention but a few, protection of high voltage circuits, interference current monitoring, filter design, and optimisation of regenerative braking characteristics. Our clients benefit from ENOTRAC’s experience and resources in other domains, especially power supply and signalling compatibility.

By replacing obsolete systems with high performance or economic solutions, modern technology can considerably extend the useful operational life of existing vehicles. This means maintaining the value of the assets and judicious use of available resources. Refurbishment of existing vehicles is a challenge, which our experienced engineers meet with relish, often in collaboration with partner organisations for the mechanical aspects or the production and delivery of control systems. The success of this teamwork approach has been demonstrated on the refurbishment of the Intercity vehicles for the Swiss Federal Railways (SBB).

In partnership with other organisations, we also develop, test, and deliver train-borne equipment, for example steering systems for Swiss shuttle trains, and line current monitors with defined safety levels fitted on rolling stock for cross-border operation.
Safety, RAMS

Rail is one of the safest modes of transport. We are making a contribution to keep it that way in the future despite higher speeds, denser traffic, longer tunnels and the increasing pressure to cut costs.

Although machines are increasingly supervising or taking over safety-critical functions, the human factor continues to play the pivotal role in the safety of the railway, whether in the development and maintenance of rolling stock and infrastructure, or in operations.

ENOTRAC is your competent partner for the development or procurement of safety-critical systems, planning and implementation of safety cases, and for independent assessment. We are fully conversant with the practical application of prevailing standards, for example EN 50126, EN 50128, and EN 50129 and their recommended methods for hazard and risk analysis. Since meeting the safety and reliability objectives requires a joint effort with suppliers and end users, we work closely with our clients’ engineers. The resulting mutual trust leads to an optimal distribution of work, and the joint use of our efficient software tools for hazard log, FMECA (failure mode, effect, and criticality analysis), and fault tree analysis. It also enables our clients to develop their own competence in the RAMS field.

This way of collaborative working has been successfully tried and tested during the development and SIL (safety integrity level) certification of line current monitoring equipment, and during comprehensive studies for demonstrating the compatibility of train-borne power converters with signalling equipment.

Thanks to the professional experience of ENOTRAC engineers in train-borne equipment design, system engineering and development, our capabilities extend beyond theoretical analysis to the development of concrete solutions and the execution of validation tests and measurements. Indeed, when it comes to transferring the methods and models of RAMS engineering to complex technical systems, ENOTRAC engineers are at their best, as demonstrated during our assignment to introduce ETCS (European Train Control System) safety equipment on the new Swiss railway lines and the Loetschberg Base Tunnel. Since the railway is a complex structure of dependent systems, achieving safety requires the solid knowledge of all the system parts. This is particularly applicable in investigative work, such as an accident investigation we carried out in Australia.
Power supply and electrification

Without electric power, nothing moves. With our capabilities for the design of traction power systems, ENOTRAC plays its part in ensuring that everything on the railway runs well.

ENOTRAC engineers perform power system studies for both new ‘green field’ installations and for the reinforcement of existing networks. Given the multitude of requirements and parameters, the assignments are multi-faceted and often interrelated: Rating and protection of substations, overhead wiring, and cables; provision of adequate voltage to the trains to maintain the desired timetable; energy saving with appropriate regenerative braking characteristics; reduction of the magnetic fields and corrosion protection with judicious earthing and bonding. The activities range from the simulation of system loading on complex AC and DC networks, to the detailed modelling of current distribution in the conductors of the railway corridor including earth, through to the calculation of magnetic fields around the railway.

For power supply design, we use powerful computer-aided engineering tools developed in-house. For realistic results, good models are required. Our experience in this area is based on many assignments such as the West Coast Mail Line in Britain and the Zimmerberg Tunnel in Switzerland. The validation of engineering tools and models by extensive tests give us the confidence to apply them on the most important projects in Switzerland: the new lines of Bahn 2000, Loetschberg and Gotthard Alpine Base Tunnels, Vereina Line, Glattal Railway. We have also used the tools for the design or verification of many MRT systems world-wide such as London, Hong Kong, Bangkok, Delhi, Sydney, Caracas, Tel Aviv, and Tehran.

Field testing is a complementary core capability encompassing power, signalling and telecommunication installations, on both rolling stock and fixed infrastructure. Our clients benefit from highly-developed measurement techniques, instrumentation hardware, analysis software, and organisational procedures.

The solid know-how and experience accumulated over numerous large projects, means that we can also provide tailored services to the many small and medium railways in Europe and globally. Thanks to our efficient software tools, proven models and methods, solid grasp of modern technology, and innovative approaches, we can also deliver practical state-of-the-art solutions to projects with modest budgets.
Organisation and processes

It takes months or years to develop and build rail vehicles, signalling equipment, and electrification plant. Yet these assets remain in service for tens of years during which they have to be properly operated and maintained. Repair and maintenance costs make up a sizeable share of the whole life cycle cost (LCC). With ENOTRAC’s support, measuring and minimising total life cycle costs in your organisation become more than an empty buzzword.

ENOTRAC provides user-friendly systems for effective management of the maintenance and utilisation of fixed assets, rolling stock, and other resources. Our products work in the background to fulfil the requirements and needs of our clients. ENOTRAC’s engineers possess the experience and training necessary to analyse, in conjunction with the client specialists, the current operational and maintenance processes and to develop concrete solutions to increase efficiency, improve quality, and reduce costs. ENOTRAC’s modular information technology (IT) systems greatly help our clients in meeting their business objectives. After all, we developed these systems and adapted them for the practical day-to-day needs, while working closely with users from rail operators, manufacturers of rolling stock and fixed equipment. Therefore, a good relationship with users at the front end is for us of paramount importance. The users appreciate the assurance that they can rely on competent ENOTRAC consultants at any time after the end of their training.

When a tailor-made IT solution is required, our ENOTRAC IT specialists come into their own. For example, they have developed interfaces to neighbouring systems for a rational data exchange, sophisticated solutions for the mobile recording of asset condition and usage data, and automatic radio transfer of diagnostic and failure data. Our specialists’ field of activity is not limited to ENOTRAC systems. This is demonstrated in the numerous applications for diagnostic data, developed for targeted weak-point analysis on most of the Swiss Federal Railways motor cars ranging from Class 450 to the tilting train (ICN).
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