THE VIRTUAL TRIBOLOGY INSTITUTE - VTI:  
AN INITIATIVE AT THE HUB OF EUROPEAN TRIBOLOGY ACTIVITY

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SUMMARY
In Europe a considerable effort has been and is being devoted, mainly on the national level, to tribology research. Consequently, a tremendous amount of know-how is available, and exciting developments are still underway. Access to European facilities by EU cross border industrial customers is still limited, however, especially for SME companies. This is not only due to geographical reasons but mainly because of a lack of information and the fact that national institutes prefer to foster their national clients. This situation considerably hampers the dissemination of project results and technology transfer at the European level. This problem is addressed by the creation of the European Virtual Tribology Institute, with the mission to bring together European competencies in the field of tribology to establish an integrated, powerful tool to improve the interaction between industry and tribology research and facilitate the transfer of technology and research results to industry and in particular SME’s for quick exploitation.

This paper presents the content of a proposal for the European Vth Framework Programme: Growth - Setting-up of Virtual Institutes (GROW-2000-7.2), which was submitted 15 March 2001.

Keywords: Virtual Institute, Tribology

1 WHY A VIRTUAL TRIBOLOGY INSTITUTE?
Tribology finds applications in all industrial sectors including the aerospace, automotive, engineering, construction, biomedical, textile, optical and micro-electronics industries. Tribology is a generic technology and is a so-called ‘enabling technology’ that makes it possible to develop new products and processes.

Losses due to wear of materials have been estimated by various sources to 1.3 to 1.6 % of the GNP of an industrialised country [1 - 5]. Industry world-wide carries massive, and largely avoidable, costs overcoming friction and repairing damage caused by wear; it is common for 10 % of the total energy consumption in a company to be used to overcome friction. Friction and wear increase the operation cost of an industrial plant by increasing the energy consumption and decreasing the life-time of components, machinery and plant. Major savings can be achieved by increasing the mechanical efficiency, reducing friction and decreasing machine downtime, as well as maintenance and replacement costs caused by wear.

Tribology research contributes to the modernisation of industry, and has a strong impact on resource (energy and materials) consumption through the development of better quality products and more efficient production. To point out just a few issues:

➢ Tribology has a significant impact on efficient production, design, manufacturing and control in all industrial sectors, through the implementation of novel materials and new technologies resulting in performances, which up till now remained unachievable. Many tribologists are working in the field of high precision technologies using micro-electromechanical systems (MEMs), nano-structured materials, etc.
Extending service life, improving lubrication, and facilitating disassembly and re-use of materials are key elements towards so-called design for the environment. Tribology has a major impact on the conservation of scarce resources, higher energy efficiency and prolonged component life-times, and thus represent a key element towards a sustainable growth of our industrial society.

Tribology research pursues to contribute to the implementation of advanced material technologies and innovative design concepts in industry. Such technological developments create a need for highly skilled technical staff, which will contribute to an increased level of education and the creation of jobs in the industrialised Europe.

Tribology is most concerned with improving the efficiency and reliability of machinery, production equipment and systems for manufacturing, which has positive consequences towards health and safety, and job satisfaction.

Today there are the following tribological bodies or organisations active on the European level.

The COST 516 Tribology action focused on bringing together research institutes and stimulating interaction between European tribology groups’ more basic research, especially within the following three topics of tribology: surface engineering, grease lubrication technology and the technology related to applications of environmentally friendly lubricants. This action has been carried out in the period 1995 - 2000 and it involved 64 projects from 21 European and 2 non-European countries. A continuation of this action is foreseen, thereby focusing on superior friction and wear control in engines and transmissions.

The international research group on wear of materials IRG/OECD is an informal European discussion forum with regular biannual symposiums related to friction, lubrication and wear mechanisms and tribological testing. This is a kind of Gordon conference type for bringing together researchers to exchange ideas and get scientific criticism at an early stage in the process of developing novel results and contributions.

The annual Leeds-Lyon Tribology Symposium is a European high level international conference series with long traditions. The symposiums are arranged every second year in Leeds University, UK, and at INSA Lyon, France. In addition there are arranged regional biannual tribological conferences like the NORDTRIB circulating among the Scandinavian countries and the BALKANTRIB circulating among the Balkan countries.

The national tribology societies, which should not be underestimated because of their history, role and funding routes, also play an important role in promoting tribology research on the European level. They also have been actively participating in the activities of the International Tribology Society that arranges on a global level the World Tribology Conference every four years.

The palette of the described existing European tribology organisations and networks is still incomplete because an organisation that would bring together the European organisations offering contract research and consultancy to the industry is missing. The establishment of the suggested VTI in tribology would fill that gap and ensure an effective transfer of the created tribological skills and knowledge to the benefit of industrial and commercial organisations. The VTI will be at the hub of European tribology activity and seen to be so, pulling together all the various strands, learned societies, organisations, and consultancy groups.

### 2 MISSION AND OBJECTIVES

The mission of the European Virtual Tribology Institute is to bring together European competencies in the field of tribology to establish an integrated, powerful tool to improve the interaction between industry and tribology research and facilitate the transfer of technology and research results to industry and in particular SME’s for quick exploitation.

The objectives of the Virtual Tribology Institute are twofold:

- Improved transfer and exploitation of results to industry, particularly SME’s.
- Co-ordination and pooling of best available EU expertise and infrastructure in tribology.

In all its activities, the VTI supports European industry in developing a sustainable, societal and environmentally responsible economic growth.

### 3 STRATEGY

The basic strategy behind the Virtual Tribology Institute is to create a win-win situation for both the RTD participants and the industry.

Industry will benefit from the VTI through:

- Easy access to centres of excellence in the field of tribology and their equipment all over Europe, while maintaining the required level of confidentiality.
- Rapid access to a team of high-level tribology experts, who are critically reviewing and in such way contributing to the quality of the contracts.
- Best value for money.

RTD participants will benefit from the VTI through:

- The greater access to European industry, and the possibility to promote activities on the European level.
- The contract research work generated through the VTI.
- The contacts with industry and RTD partners in the VTI, which may result in joint cluster projects.

As illustrated in figure 1, the industrial clients, big companies as well as small and medium sized enterprises, and the VTI need each other just like the bees and the flowers do. Indeed, through the VTI the
industrial companies will be able to solve their problems or develop new ideas at best value for money, while the RTD member participants benefit from the contract research work generated in the VTI.

It is expected that through the increased collaboration between industry and RTD organisations, the tribology research of the latter will be better geared to the requirements of industry. The VTI will be a powerful tool for transferring new technologies to industry, thus implementing innovation.

4 TASKS AND OPERATION

There are four main tasks of the VTI. The target of workpackage 1 is to develop the VTI into a tribology services and consultancy centre for the European industry, particularly SME’s. A legal advisor in the consortium will ensure that contract procedures etc. are correct. The VTI will be fully aware of developments in its field of interest, the needs of potential clients and users of its technologies and services and the capabilities of all RTD partners in its field of endeavour. Hence, it should be able to play a significant role in encouraging interaction between the various players and in creating clusters of users and research providers, which is covered by workpackage 2 - research brokering. Marketing the products of the VTI is the purpose of the third workpackage, with the objective to inform the customers of the VTI about its activities and how to make use of the VTI for their benefit. Finally, as smooth and effective communication is clearly essential to the success of the VTI, this will be dealt with in workpackage 4. This will involve the setting up of a web-site and communication structure tailored to the requirements of the VTI. The general management task is covered by a separate workpackage.

4.1 Organisation of Tribology Contract Research and Consultancy Services

Tribology research, analysis and testing services and consultancy will be offered to the European community (mainly industry, but also governmental bodies as well as any other customer). The access threshold will be kept as low as possible, to stimulate SME companies to make use of the facilities and technologies available in the European Virtual Tribology Institute. This is clearly essential to the success of the VTI, since the driving forces for the growth of the VTI is the generation of contract research work. Companies should be able to easily discuss their problems or new ideas, and through the VTI find RTD partners that are best placed to deal with their questions.

Procedures will be developed to organise the contract research that will be generated through the VTI, as well as to ensure that a percentage of the charges for the contracted research are paid to the VTI.

The commitment of the RTD partners as well as of the industrial customers of the VTI must be ensured. A ’laisser faire’ policy could render the corresponding risks (see further section 6) too high. In addition, procedures must be developed to preclude unfair competition between RTD partners. E.g. universities do not usually count all overhead costs while that is not the case for contract research organisations. A common cost basis must therefore be agreed. As the VTI will work with many SME’s in different countries, the language issue has also to be dealt with. The VTI will have partners and national representatives in every country that the VTI will operate in. One of these representatives will serve as the national contact point (NCP) for the VTI, which can be easily reached.

4.2 Research Brokering

The collection of knowledge about the developments in tribology, the associated research activities, the problems and demands of industry, and the joining of capabilities of many RTD partners in their field of endeavour provides the VTI with an unique competence for encouraging interaction between the various players in the field and creating clusters of users and providers of research services for an effective and synergistic definition and elaboration of tribology research of top-importance. The VTI can thus provide a research platform for research brokering, where the users and the providers are brought together to inaugurate tribology research in which a competent cluster consortium can jointly participate in a research programme.

When a sufficient industrial interest for a specific topic is identified, a cluster project co-ordinator with extensive expertise in the subject field will be mandated to develop the ideas and interests into a joint research cluster project with problem- or opportunity-specific objectives, methodology, milestones and consortium tailored to the requirements of the industrial partners in the project. Funds will be made available by the VTI to facilitate such initiative. Moreover, the initiator(s) are able to make use of all VTI facilities such as for example the competence databases, dedicated communication system, contacts with industry, etc. to strengthen the consortium and facilitate the project development.
Also in this case, appropriate contract procedures must be developed to organise these cluster projects, with arrangements concerning intellectual property rights, confidentiality, publication policy, etc. which are acceptable both to the industrial enterprises and the RTD performers.

### 4.3 Marketing

The bulk of promotional actions will be directed to the industrial customers of the VTI. However, promotional action will also be necessary vis-à-vis the VTI members. Different actions have been planned.

- The definition and implementation of a marketing strategy and associated marketing plan.
- The organisation of promotional campaigns.
- Participation at trade fairs.
- Carrying out strategic studies and issuing the results in the form of reports.
- The organisation of workshops and seminars.

These activities aim at strengthening the position of the VTI and/or improve the image of tribology research, which will contribute to the confidence of the (potential) VTI customers in the results and services provided. Strategic studies and reports will be issued - research and technological reports but also market analyses, socio-economical and environmental studies - to promote the widespread use of advances in tribology research in the European industrial and societal communities. The actions will be carried out by the VTI members on an ad-hoc basis, supported by the VTI.

### 4.4 Communication

This workpackage involves the setting-up of a whole electronic communications structure and procedures tailored to the requirements of the VTI using modern ICT tools.

A web-site will be created to promote the services and activities of the VTI to the public and particularly to potential customers in the European industry, and to present its partners. The member participants will be able to communicate, download and distribute information, receive and reply to queries, and prepare project proposals by entering their own ‘virtual office’. The intention is to make the concept of the VTI more concrete, by provoking the illusion that the VTI is situated in a real building. The web-site will be an open client site, accessible for any customer with technological queries in the area of tribology. All queries will be registered and treated confidentially. The whole process including question, request for an offer and the submission of proposals by the VTI participants will be exclusively managed by the VTI members, and will be automated as far as possible. Access to the information in the proposals will be restricted to the client. All electronic transaction of information between requester and provider will be encrypted at the required level of security for each process.

The operating cost of the VTI is associated with promotional activities (participation at trade fairs, the organisation of workshops and seminars, the issuing of reports and studies, general promotion material and advertisements), the set-up of the web-site and communication system, legal advice, initiatives towards cluster projects (research brokering), travel and subsistence of all partners, and the management of the VTI.

The first 3 years are supported by the EC. From the second year on, industrial projects will be initiated and new RTD participants will be attracted to participate in the VTI. The revenues associated herewith are used to quicken the start-up of the VTI. In this way, a smooth transition towards the complete self-sufficiency of the VTI will be realised, and it will be possible to reduce public financing by the EC. Experience from the initial contract work will be used to steer and refine the VTI procedures accordingly.

After three years, the VTI will be an independent body with an own legal status. To facilitate that process, legal advice support will be available. Depending of the situation and the success of the VTI, the legal status after the EC financing period could for example be a non-profit organisation or a ltd. company.

## 5 STRUCTURE AND CONSORTIUM

VITO will assume responsibility for the overall management of the VTI project, and will act as treasurer of the VTI, at least for the first three years when the project is funded by the EC, to handle the external revenues from the participant fees and percentage of the charges for the contracted research generated by the VTI. A legal advisor will be called in to ensure that the procedures developed for the VTI contract services are correct, as well as for the setting-up of an independent body after the EC financing period. Moreover, a Central Management will be installed at VITO, where an experienced staff will be able to devote 100 % of their time to carry out the day-to-day management of the VTI. This is considered critical for the success of the VTI, to render the organisation less virtual thereby facilitating commitment of the members.

The VTI Steering Committee (SC) is responsible for the management of the VTI, and is represented by BAM, CTD, NPL, Tekniker, VTT and VITO. The limited composition of the SC will ensure an efficient day-to-day management of the VTI, precluding a cumbersome management process with insufficient decision power to reach the targets of the VTI.

All members will have their say in the organisation and procedures of the VTI. This will be ensured by an open and efficient communication flow, inter alia through a specially designed electronic communication system as part of the VTI web-site.
As shown in figure 2, the group of organisations that have joined forces to start the VTI is very well spread geographically in Europe, which will undoubtedly contribute to its success. This partnership consists of 22 renowned organisations in the field of tribology, representing 12 EU member states and 4 associated states.

From the second year on, new RTD participants will be attracted to participate in the VTI on an equal basis. These early participants can profit from the reduced participation fees, which are offered during the second and third year of the VTI.

6 RISKS
The main risk for the Virtual Tribology Institute is that it is a virtual institute, which may result in a lack of commitment and local focus. An important asset to cope with this risk is the instalment of a Central Management with staff that will be able to devote 100% of their time to run the VTI. Moreover, the VTI will have partners and national representatives in every country that the VTI will operate in, which will serve as national contact points (NCP) facilitating close contact with local customers.

The web-site and tailored communication system will also be an important instrument for rendering the VTI less ‘virtual’. The member participants will be able to communicate, download information and queries, and prepare project proposals by entering their own ‘virtual office’.

Of particular importance are issues of confidentiality. Procedures will be used to process the orders of industrial clients in a strictly confidential manner. All electronic transaction of information between requester and provider via the web-site will also be at the required level of security for each process.

There are also more obvious risks threatening the operation of the VTI. For example, if a link is established between a company and an RTD partner through the VTI, both could leave the VTI and continue between themselves. It will be attempted to establish watertight and transparent procedures to ensure that the customers and RTD partners are committed to the VTI. But more importantly, the VTI should create such an added value that industry and RTD organisations find it an indispensable means for European contract research, to create loyalty from its participants and customers.

7 CONCLUSIONS
In Europe a considerable effort has been and is being devoted, mainly on the national level, to tribology research. Consequently, a tremendous amount of know-how is available, and exciting developments are still underway.
There is a lack of tribology research co-operation within Europe, however. The principal reference framework for research activities in Europe is national. There are also very few sources of full-time independent tribology help. The strength of the VTI will be to generate a pan-European Tribology Institute breaking through perceived boundaries.

The mission of Virtual tribology Institute is to bring together European competencies in the field of tribology to establish an integrated, powerful tool to improve the interaction between industry and tribology research and facilitate the transfer of technology and research results to industry and in particular SME’s for quick exploitation.

In all its activities, the VTI supports European industry in developing a sustainable, societal and environmentally responsible economic growth.

The objectives of the Virtual Tribology Institute are twofold:

- Improved transfer and exploitation of results to industry, particularly SME’s.
- Co-ordination and pooling of best available EU expertise and infrastructure in tribology.

The setting-up of the VTI is the subject of a proposal submitted to the European Vth Framework Programme. After three years, the VTI should become an independent body with an own legal status. It will be financially self-sufficient. External revenues stem from RTD participant fees and more importantly, a percentage of the charges for the contracted research.

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9 REFERENCES