# AUTOLUBRICATING CERAMIC COATINGS: APPLICATION TO THE IMPROVEMENT OF RELIABILITY AND EFFICIENCY IN THERMAL ENGINES

## Fact Sheet

Project Information

Grant agreement ID: MA1E0032

Project closed

**Start date**
1 May 1988

**End date**
31 October 1990

**Funded under**
Research programme (EEC) on materials (raw materials and advanced materials) - Advanced materials (EURAM) -, 1986-1989

**Total cost**
No data

**EU contribution**
No data

**Coordinated by**
Hydromécanique et Frottement SA
France

## Objective

Some coatings, such as conventional WC-Co systems, are capable of providing unexpected friction properties. The research deals with the study of this new family of coatings with improved friction properties. The objectives are: - Modelling their behaviour in order then to generalize their use with the maximum potential of

success. - Studying the interaction between the friction properties and the operating conditions with a view to tracing all maximum permissible performance. - Checking the correct balance between the coating properties and their use on certain diesel engine components.
Much of this work was devoted to basic research into the influence of different parameters on the tribological properties of tungsten carbide cobalt coatings and analysis of the friction mechanisms. This was done by taking into account the main parameters - such as plasma power, type and percentage of secondary gases, plasma gas flow, spraying distance, composition and manufacturing process of powders (sintered/agglomerated/coated), and studying tribological behaviour in various situations (mating materials, geometry of contact, lubrication, etc).

The friction properties of the tungsten carbide cobalt coatings are closely dependent on the mode and degree of decomposition of the carbides on spraying. The coatings with improved friction properties show increased adhesive wear resistance.

Feasibility trials were conducted using a diesel engine equipped with special components to which the new ceramic coatings had been applied. Improvements in oil consumption were demonstrated.
IT IS PROPOSED TO INVESTIGATE A NEW COMPLEMENTARY APPROACH TO AN EARLY INVENTION OF HYDROMECANIQUE ET FROTTEMENT WHERE PLASMA SPRAYED CERAMIC COATINGS OF THE "CARBIDE & BINDING ELEMENT" TYPE , HAVE THE PROPERTY OF BEING AUTOLUBRICATING I.E. THEY GIVE A VERY SMALL VALUE OF THE FRICTION COEFFICIENT COMPARED TO THE ONE OBTAINED WITH THE BEST KNOWN CERAMIC MATERIALS.

IT HAS BEEN SHOWN THAT, FOR A LUBRICATING LAYER TO APPEAR IT IS NECESSARY TO HAVE FREE CARBON IN THE CERAMIC COATING WHILE, AT THE SAME TIME PHYSICO-CHEMICAL TRANSFORMATIONS OF THE BINDING ELEMENT, DUE TO THE FRICTION, MAY BE INVOLVED.

TO SUPPORT THE RESEARCH DETAILED METALLURGICAL INVESTIGATIONS, EXPERIMENTAL VIBROMETRY PROGRAMS AND FRICTION TESTS ON REAL ENGINES WILL BE CARRIED OUT.

THE PRELIMINARY STUDIES HAVE LEAD TO AN INITIAL UNDERSTANDING OF THE FRICTION MECHANISM. AS SOON AS FRICTION COMMENCES, A LUBRICATING LAYER (TRANSFER LAYER) IS GENERATED. IN CASES OF REMOVAL DUE TO WEAR, IT CAN BE GENERATED AGAIN DURING THE FRICTION.

IT IS QUITE REALISTIC TO THINK THAT, IF SUCCESSFUL, THIS RESEARCH

WILL HAVE AN IMPORTANT INDUSTRIAL IMPACT IN AREAS LIKE CYLINDER LINERS, PISTONS, PISTON RINGS, VALVE ROCKERS, ETC.

## Fields of science (EuroSciVoc)

engineering and technology > mechanical engineering > **manufacturing engineering**

engineering and technology > mechanical engineering > tribology > **lubrication**

natural sciences > chemical sciences > inorganic chemistry > **inorganic compounds**

natural sciences > chemical sciences > inorganic chemistry > **transition metals**

engineering and technology > materials engineering > **coating and films**

## Programme(s)

FP1-EURAM - Research programme (EEC) on materials (raw materials and advanced materials) - Advanced materials (EURAM) -, 1986-1989

## Topic(s)

Data not available

## Call for proposal

Data not available

## Funding Scheme

CSC - Cost-sharing contracts

## Coordinator

**Hydromécanique et Frottement SA**

EU contribution

**No data**

Total cost

**No data**

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## Participants (2)

### CORK REGIONAL TECHNICAL COLLEGE

Ireland

EU contribution

**No data**

Address

Total cost

**No data**

### EMPRESA NACIONAL DE AUTOCAMIONES SA

Spain

EU contribution

**No data**

Address

Total cost

**No data**

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