

7th EASA Rotorcraft Symposium

The new REACh legislation: Industrial and Certification challenges for dynamic systems



thinking without limits

Cologne, 4-5 December 2013

Agenda

- Problematic REACh
- EUROCOPTER strategy
- Technological Test Program
- Management design changes
- Conclusion



This presentation focuses on dynamic systems for metallic components (rotors, gearboxes, transmission shafts)

Problematic REACH

NEW EUROPEAN REGLEMENTATION, REACH :

- REACH = “Registration, Evaluation, Authorisation and Restriction of Chemicals”
- Main goal of this reglementation is health protection of European people; Process is the following:
 - Evaluation of quantities of different substances used: from chemical industries,
 - Evaluation of the nocivity of these substances by the european organism EChA (*European Chemicals Agency*),
 - List of banned substances by EChA,
 - Implementation of substitute products by suppliers and industrials.

Problematic REACH

Chemical substances



For Eurocopter suppliers

Solvents, pigments et polymers

Preparations



For Eurocopter

Paints, Surface treatments...

A lot of preparations impacted at Eurocopter:

- ***Cadmium plating***
- ***Chromic Acid Anodizing***
- ***P05/P20 primers***
- ...

Parts



For Eurocopter

*Helicopters,
New parts and Spares.*

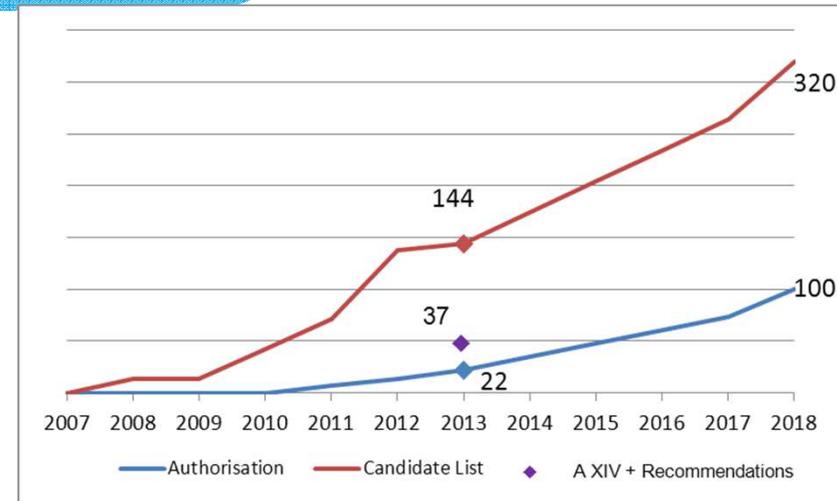
Thousand of parts

Substance Name
Chromate trioxide
Sodium dichromate
Potassium dichromate
Trichloroethylene (trichloroethene)

Problematic REACH

- 22 banned substances
- 17 substances on recommendations
- 144 substances in the candidate list

→ It is a continuous progression problematic



↳ Priorisation of substances for replacement/authorisation

- **Thousands of concerned parts with a high number of critical parts (dynamics system)**
- Therefore there will be no "learning" phase through, for example, the entry in service of a new aircraft: all the fleet will be concerned at the same time through the delivery of new aircrafts but also by the spares.
- **Impossible to apply current rules for certification and design changes (internal EC rules and regulations CS29 & CS27)**

Problematic REACh

IMPORTANCE OF SURFACE TREATMENTS FOR DYNAMIC SYSTEM

– Protection against corrosion :

- » Atmospheric corrosion
- » Galvanic corrosion - Contact between parts
(*examples: titanium/steel or light alloys / carbon*);
- » Complex phenomena as « fatigue corrosion »

– Behavior regarding wear

- » Friction coefficient
- » Sacrificial layer

- Protection against impacts, scratches, ...

– Particularity of mechanical parts

- » High fatigue loading and numerous critical parts.
- » Wear and corrosion phenomena could have a significant effect on the fatigue behavior.

Current surface treatments have been used for many decades.

EUROCOPTER Strategy

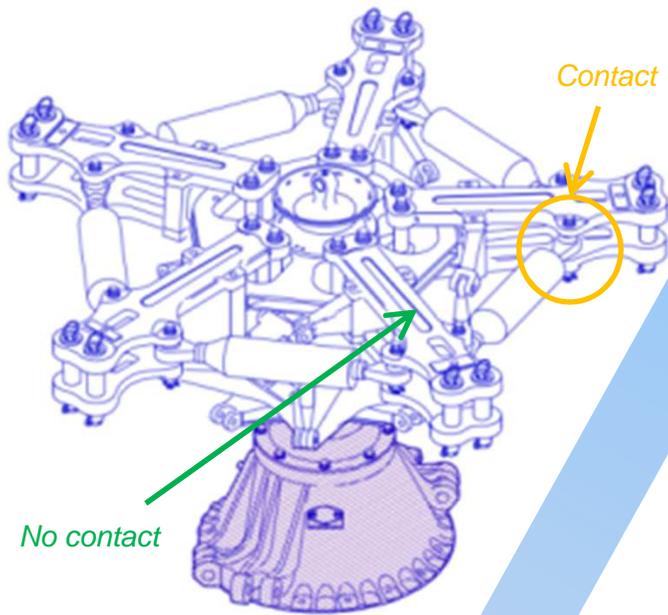
EUROCOPTER Strategy : Building approach

- New substitutes: product qualification
 - 1- Choice of the new product based on « basic » coupons.
 - 2- Qualification of the new product based on « basic » coupons: in a simplified way this phase qualifies the new product itself.
 - → as far as possible common products are chosen in the aeronautical industries
- Dynamics system specificities: certification of the components
 - 1/ Analysis of the different assembly technologies in terms of material/surface treatment in contact (between new products and current ones).
 - 2/ Definition of the **comparative** technological tests (between current design and future design).
 - 3/ If necessary complementary test on full scale components.

EUROCOPTER Strategy

© Eurocopter rights reserved

7th EASA Rotorcraft Symposium / 4-5 december 2013



Full scale components

detailed features

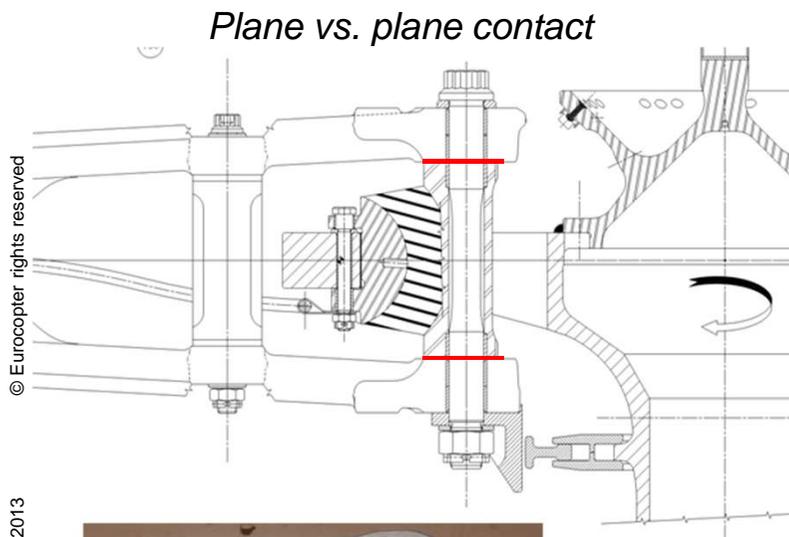
Coupons

Technological Test Program

-  *Fretting wear tests*
-  *Fretting fatigue tests*
-  *Complementary wear+corrosion tests*
-  *Specific corrosion tests*

Technological Test Program

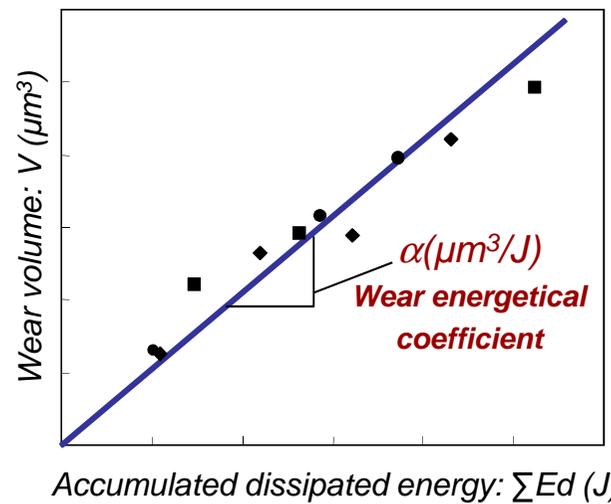
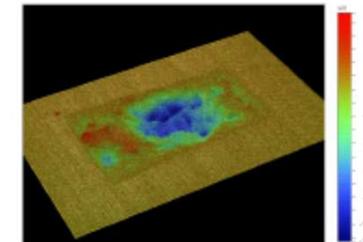
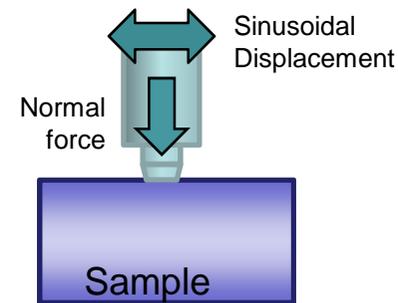
Fretting Wear Test : Comparison of friction coefficients and wear rates



© Eurocopter rights reserved



Spherical bearing surface in contact



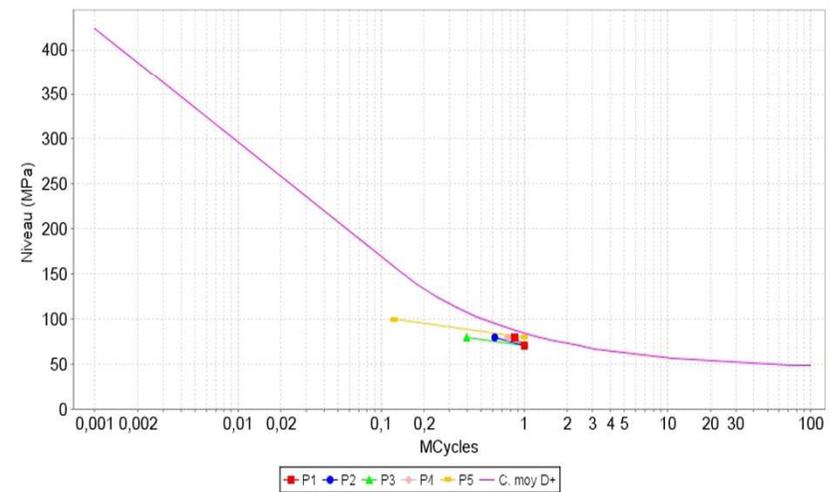
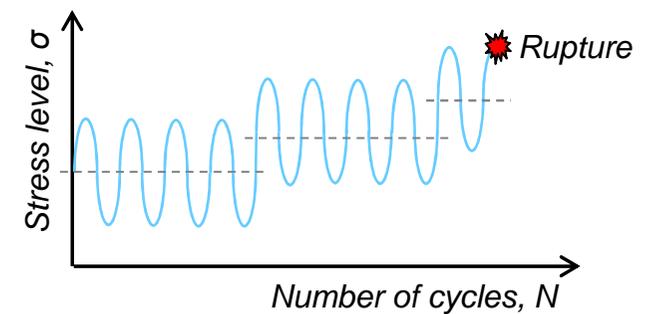
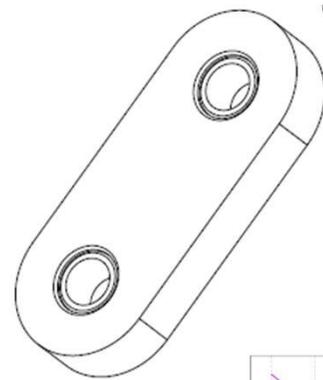
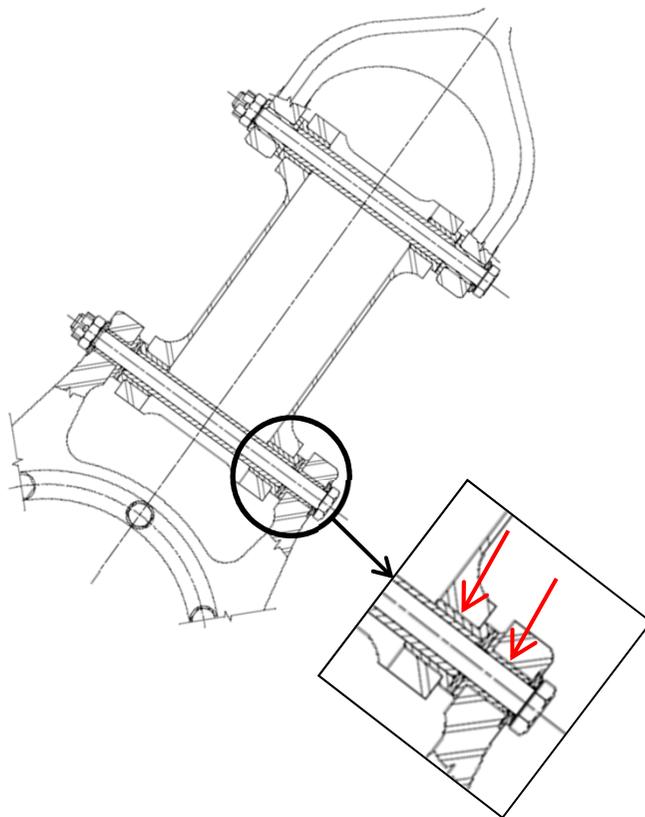
Quantification of the wear cinetic

7th EASA Rotorcraft Symposium / 4-5 december 2013

Technological Test Program

Fretting Fatigue Test : Fatigue curves comparison (Wöhler)

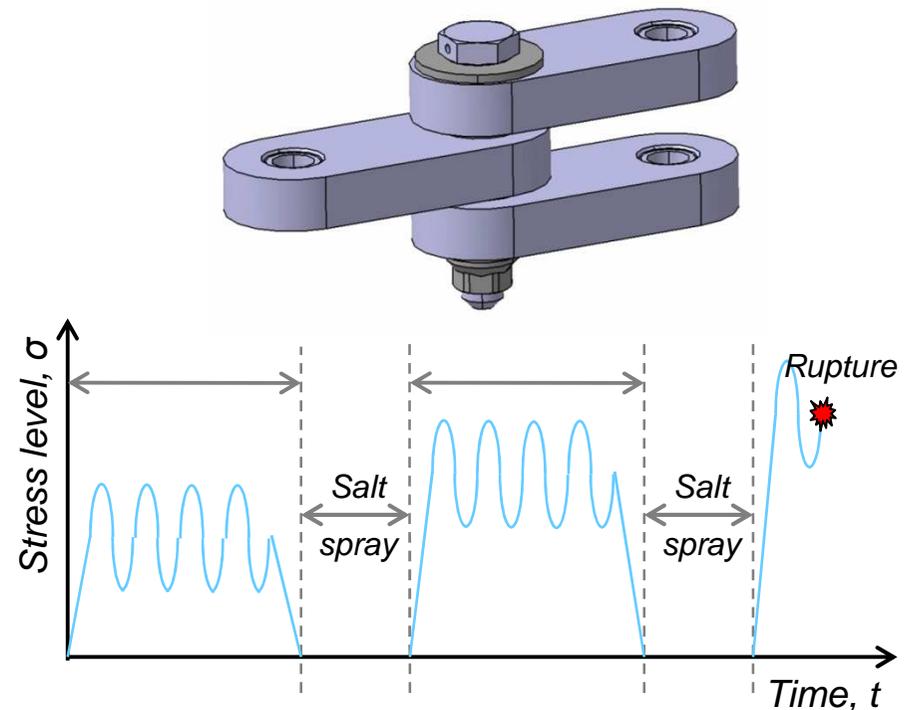
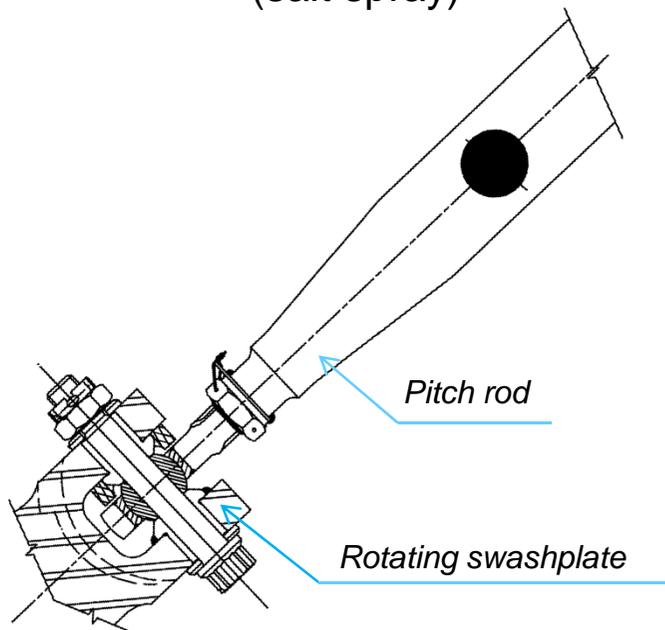
Cylinder vs. Cyclinder contact



Technological Test Program

Complementary tests for screwed link tests (Fatigue + corrosion)

- Repeated cycles of fatigue loadings and time under aggressive environment (salt spray)

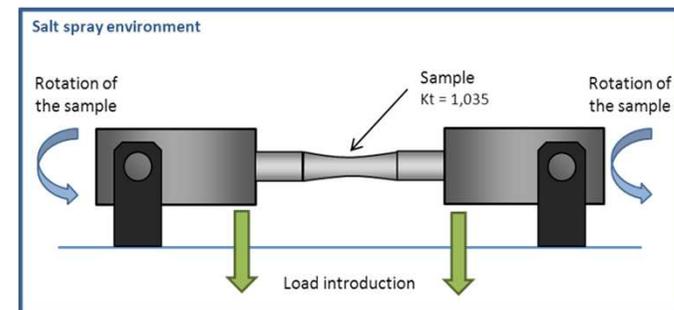
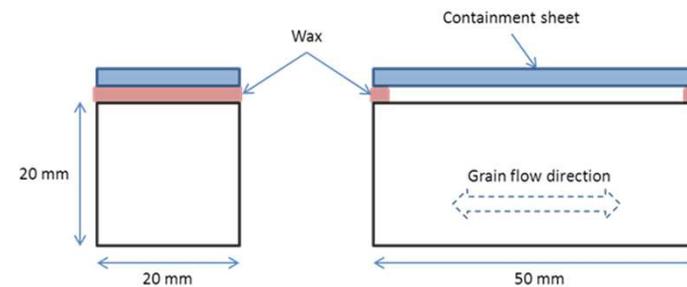
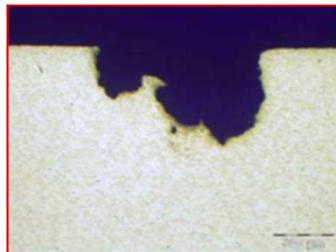
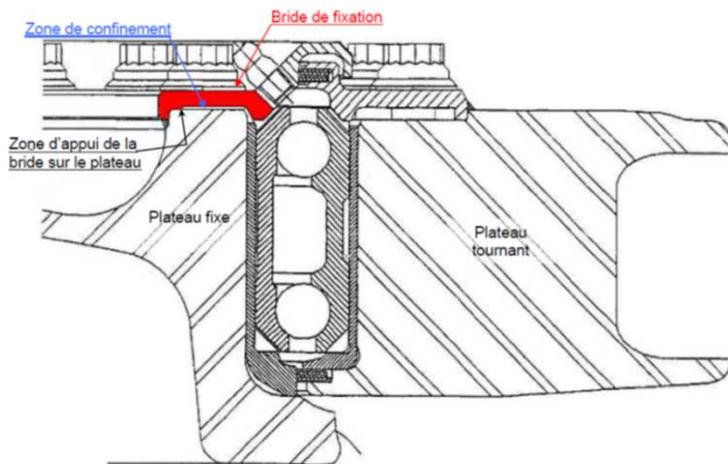


Analysis in terms of wear rates, corrosion pits, and fatigue level reached.

Technological Test Program

Specific tests for corrosion issues

- Corrosion in a confined area
- Some fatigue corrosion tests (corrosion under fatigue loading)
- Galvanic corrosion (e.g protection between steel and tungsten carbide)



Management design changes

Management design changes; It could be done through different means:

- Manufacturing sheets
- Mark on the components
- Others means ...
- New batch of serial number
- New part number

The rational is not yet defined; It will depend on:

- the tests results,
- the criticality of the components,
- the experience associated, the repair procedure (if any).

CONCLUSION

- REACH is an important challenge for H/C mechanical parts :
 - Most of the current surface treatments are impacted
 - Surface treatment is an important issue for wear, fretting, and corrosion behavior
 - Thousands of parts with a high number of critical parts are concerned (cost and delay are key issues): new and spare parts



- Impossible to apply current rules for certification and design changes (internal EC rules and regulations CS29 & CS27)



- EC is defining a specific process for the certification (products and components)
 - Participation and agreement of EASA is needed