

## **Fretting-fatigue endurance under corrosive seawater environment**

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### **KEYWORDS**

Fretting-fatigue, Corrosion, Cracking

### **ABSTRACT**

Many marine applications are subjected to fretting fatigue stressing (i.e. combined fatigue and cyclic contact stressing induced by micro-displacement combined with tribocorrosion degradations) However, the synergic interaction between corrosion and fretting loading regarding the fatigue endurance is still scarcely explored. It is well-known for dry contact that the application on a fretting contact by favoring the crack nucleation sharply reduces the fatigue endurance [1,2]. Besides, it has been reported that sea water decreases the fatigue endurance by corrosion phenomenon. A key issue concerns the combined interaction between fretting contact and corrosion regarding the fretting-fatigue-corrosion response [3].

To analyze this aspect, an innovative fretting-fatigue test machine has been developed, in which an electrochemical cell was integrated in order to study the fretting-fatigue loading under a controlled corrosive environment (Figure 1). Fretting-fatigue endurance curves have been established for dry and wet conditions (pure water and seawater) for a given fretting displacement amplitude varying the applied fatigue stress of 5 Hz. This experimental analysis shows that pure and sea water increases the fretting endurance. This surprising result was related to a significant reduction of the friction coefficient observed in wet conditions. By dividing the friction coefficient by a factor two, pure and sea water considerably reduced the contact fretting stressing and consequently increase the fretting-fatigue endurance compared to dry conditions. However, investigation of lower loading frequency suggests that corrosion mechanisms could influence the crack nucleation. A global description of seawater condition regarding corrosion and friction behavior is introduced taking into consideration the effect of loading frequency and fretting displacement in the interface.

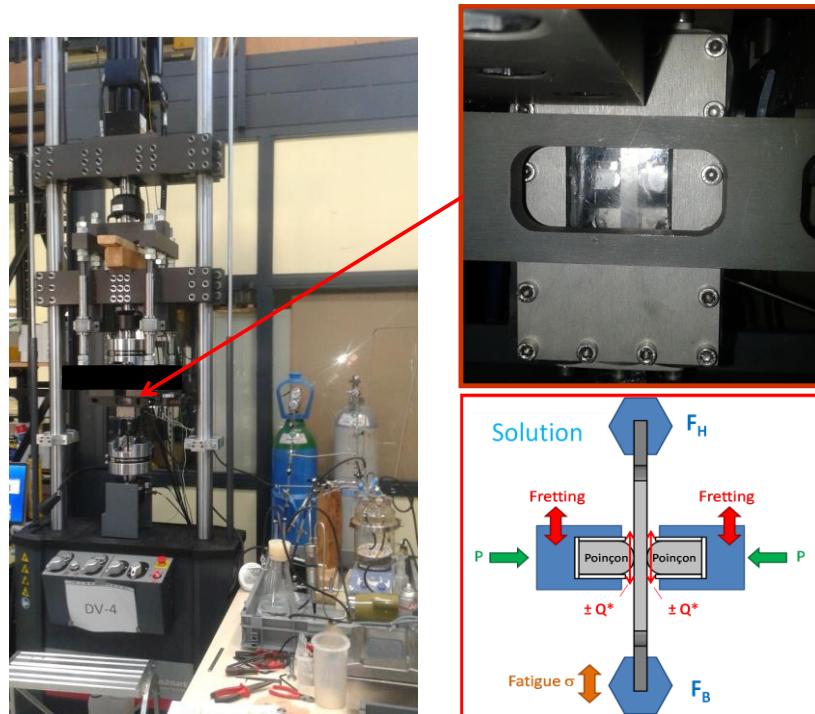


Figure 1. Experimental set-up image of the fretting-fatigue-corrosion test machine (left) and a schematic illustration (right).

## REFERENCES

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