ECA technology of CCS



CCS
CHINA CLASSIFICATION SOCIETY
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ECA Introduction

ECA - Engineering Critical Assessment

ECA is based on the principle of "Fitness for Service ", and the structure of welding flaws is evaluated for fracture and fatigue.

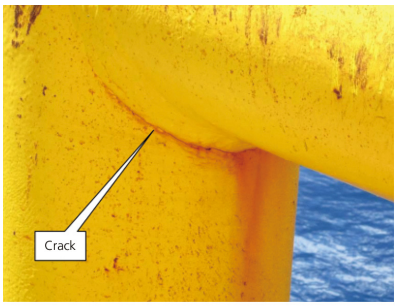
Welding defects:

Blowhole, Incomplete fusion, Incomplete - penetration, Slag inclusion, Crack

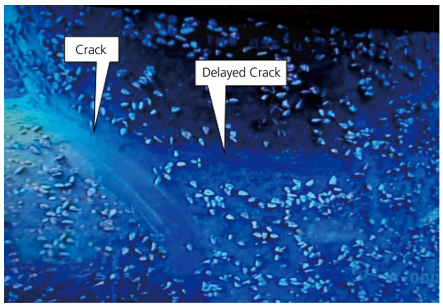
Fitness for Service (FFS):

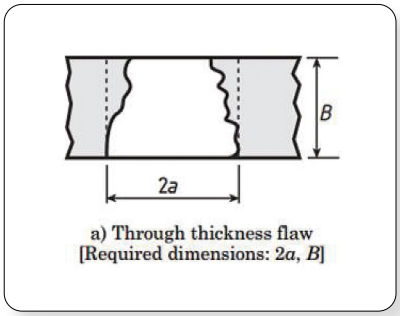
(1) Explicit recognition of welded structures with the possibility of the flaws.

(2) Ensure that the structure does not occur any known mechanism of failure on the basis of stress analysis, fracture mechanics analysis, nondestructive testing and other scientific research.

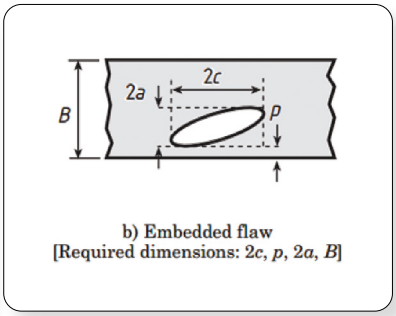




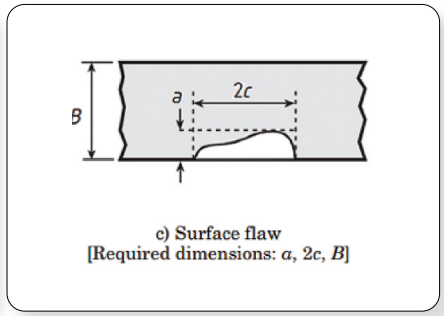




a) Through thickness flaw
[Required dimensions: 2*a*, *B*]



b) Embedded flaw
[Required dimensions: 2*c*, *p*, 2*a*, *B*]



c) Surface flaw
[Required dimensions: *a*, 2*c*, *B*]

ECA evaluation results

1. Allow the flaws that do not affect the safety and reliability .

2. If the flaws do not cause any damage, but will extend in the service period ,life prediction analysis should be carried out and monitored.

3. If the flaws have threats to the safety and reliability, measurements/actions should be taken immediately to repair or stop using.

Application of ECA in offshore facilities

Application

Application phase

Construction	Installation	In-service
		
According to welding of structures in the construction stage, ECA technology is to determine the acceptable defect size and make repairing standard.	If the accidental impact happened, ECA technology is to evaluate the structure status replace, repair or continue to use, also do the life prediction analysis and make inspection plan.	The flaws are generated during the service period, the ECA technology can determine the measures , as well as predict the lifespan for overage platform.

Application facilities

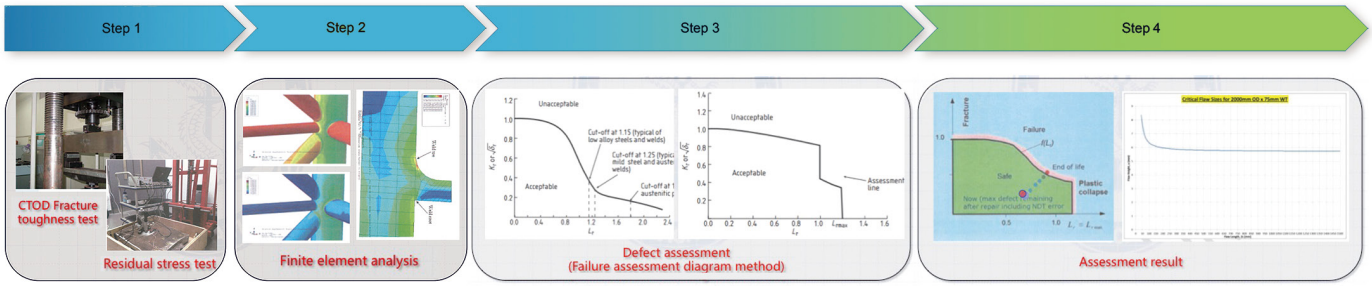
Fixed platform	Mobile platform	Subsea pipeline
		

Advantages of ECA technology

1. ECA technique is to allow the existence of flaws on structure in its remaining service period or the next inspection period in premise of that no failure occurs.
2. ECA technique can effectively accelerate the construction cycle, reduce project cost, make reasonable inspection plan and ensure safe operation , which is important to reduce cost and improve the economic and social benefits.

Introduction to ECA Technology

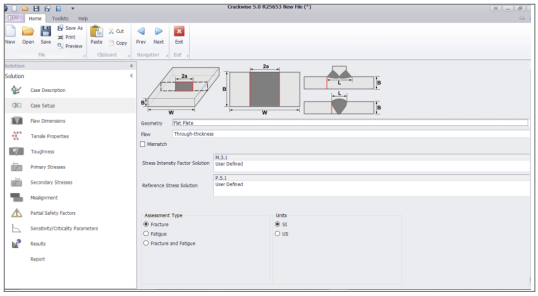
Assessment procedure



ECA Technology capability about CCS

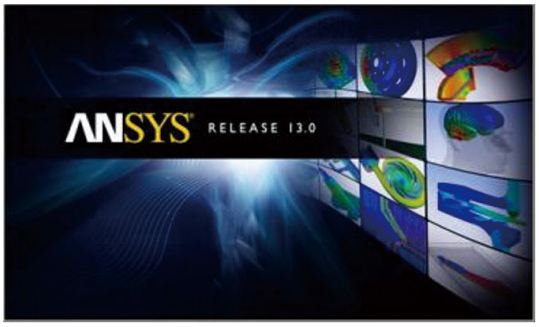
- **Technical capability**
  - Do the ECA evaluation of the construction, installation and service of offshore facilities based on the BS7910
  - Do the ECA evaluation by Using the finite element method and fracture mechanics method for the non conventional structure

- **Analysis Software**

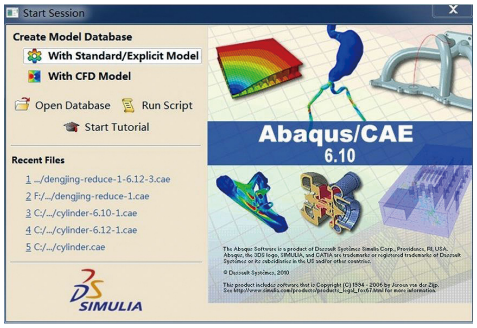


CRACKWISE

ZENCRACK



ANSYS

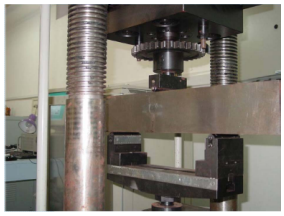


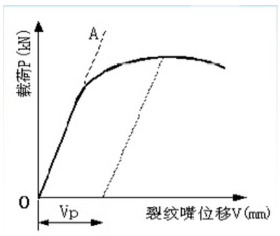
ABQUAS

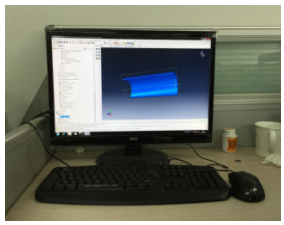
ECA Case of CCS

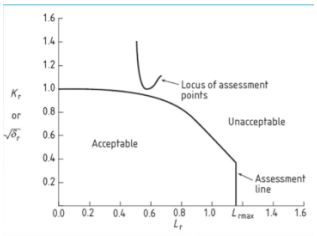
◎ Subsea pipeline ECA analysis

ECA analysis can evaluate the acceptable critical size of welding flaws and make repair standard during the construction and installation period according to the specific welding process.



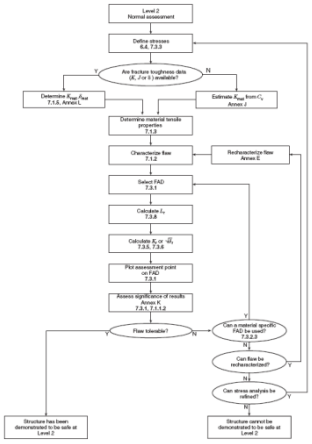


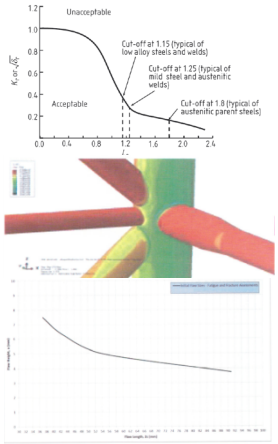




◎ Jacket ECA analysis

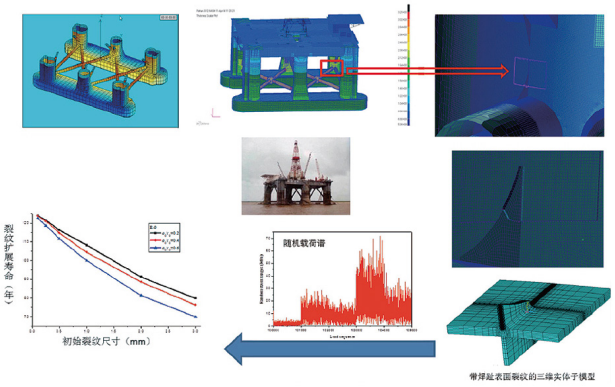
ECA can evaluate the K/T/Y node of jacket and determine the maximum acceptable crack size.





◎ Mobile offshore unit ECA analysis

The mobile unit often do not have maintenance conditions when the flaws are checked during the in-service period, ECA can make reasonable maintenance plan and repair during docking survey period.



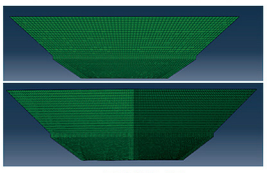


图 桩靴模型图

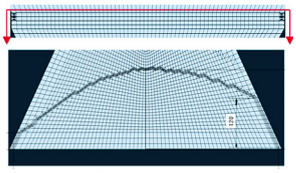


图 裂纹模型图

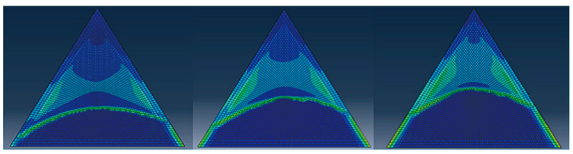
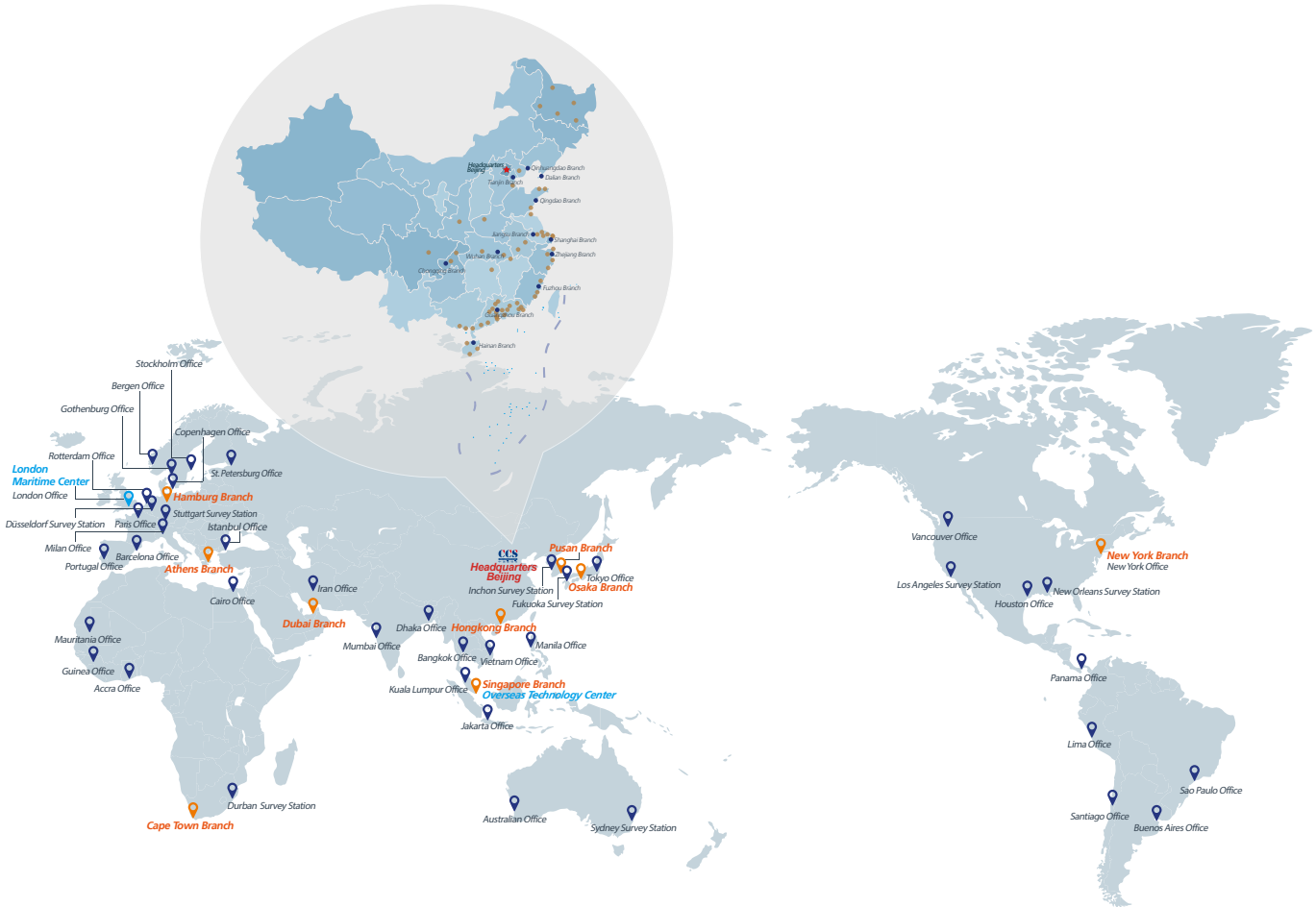


图 裂纹扩展图

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