ON-EQUIPMENT SITUS TESTING TECHNOLOGY

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Abstract: Situs testing need not disassembly and move object's mounting position or organism tissues, preventing from failures and damage by people with unfit working. Generally, it consists of structure and work piece flaw testing out-of-order diagnosis performance parameter measure working state monitoring or supervisory controlling and so on.

Keywords: aircraft flaw situs testing

The concept and development of situs testing

Situs testing is that objects are inspected and tested on installation fixed situation or in nature combination. The technique is widely used about aviation □space flight □creature engineering and so on. It is high speed□easy and efficiency. So it is the important form of modern testing technique.

Before the middle of sixties of the century, people thought that it must exist friction with work of space parts of a machine, so it would cause trouble and unsafe, it was usually checked, removed and prevented by disposing the machine parts perfectly, so it does not only expend lots of working time, but also brings waste and trouble that are caused by people. In the last of sixties, it was recognized that the apparatus with rule of exhaust trouble were suit to protect at the certain time , and the others without rule of exhaust trouble were suit to protect by testing□watching and supervising .In the beginning of 1979 , some engineering department of PLA carried out the repairing idea of reliability ,and made many protecting means revolution with the important of situs testing □nondestructive testing □state watching □rapid filling and repairing technology for all kinds of equipments and all professions .Many people take a large of time to research the convenient or the!

moving mode equipment. At the same time, civil aviation □railway □ship □chemical industry, and so on, all these branches value the research of situs testing equipments and the development of situs testing technology . In order to make that more efficiency and mechanized so that they are used at out-area, the Weston and Europe made the car with all kinds of testing equipment, for example, the only kind and professional car of su-27 is a fact. Now when the aircraft will be maintained about the majority of parts, the fact is still that it can be tested after being spared in our country. The later work usually is more tens time than the former, so its trouble is harder and harder, so all equipment□ structure and parts that can be tested with situs testing should use situs testing . At medicine area in 1984, Kary Mull first made PCR (polymerase chain reaction) that is a creature technology that adds pieces of DNA through the choice from out environment. In other words, PCR ! that is In situs polymerase chain reaction, began in the first of nineties, now it is used to test cell DNA or RNA, It is high sensitive new technique so that it can test certain DNA or RNA order in cells .In 1999 one aeronautical institute of PIA researched out aircraft equipment VXI situs testing system .In 6,2000, another engineering institute spoke that they found situs testing for the phenomenon of rocket ball, but it can't use the steps of taking samples analysis□light a fire, so its reliable and safe were better. In 7, 2000 another engineering institute of sea force used the industrial CT construct, and took it easy to move deciding position to aim at middle and comprehensive testing. Now it has accomplished that situs testing is for the whole object about solid rocket engine, and gained high quality first pictures and raw data. Its main performance such as space recognize was the national advanced lever .Now situs testing technique with bright characteristic is for! med a new testing technique step by step, which is separate from the normal checking and testing. That is used in the areas of industry□construct and medicine, especially being used to aircraft.

Means and functions of aircraft Situs testing

Aircraft situs testing includes that discontinuity testing of parts□ out-of-order diagnosis□performance parameter measure and statement watching and so on . Now its means usually include: light watching□ radiography inspection□magnetic particle inspection□liquid penetrate testing□acoustic emission□eddy current testing, and so on . Except for the light watching testing, other means are all indirect testing means. For example, radiography is often used for the inspecting groups of industry department or aeronautical professional department, but now troops generally don't use it. With the development of computer technique, radiography becomes more and more important, and when it is used at present point, it can perform more directly and easy. Its main aim is testing performance□inspecting combination and fatigue cracks when parts is being used, so you can watch the development of the closed discontinuances, and make parts work safely and avoid the trouble. Now it is !

used to have situs testing about plane system □on -equipment at out-place and inspect or measure its technique state and performance reference □crack of aircraft structure or engine blade for airplane time testing, It is also used to test special and common protection, such as testing engine comprehensive adjuster□air-controlling part□ current system and performance reference of oil system, inspecting the performance and working state of radar's trailing system□ measuring distance system□showing system □accepting and counting system. Testing controlling performance and characteristic reference of flying controlling□fire controlling system and warning system, inspecting trouble of meters□electrical machinery□electronic brain. Because that new material□new structure (such as compound material. bee-home structure)are widely used, now the situs testing new techniques of infrared rays□acoustic emission□ultrasonic and taking laser photos are widely developed. Taking! a Laser photo to have situs testing can gain aircraft-wing dynamic holography to find out flaw picture. For the difference of principle and suit limits, in order to improve its reliable, it can choose one or two kinds of means to test that is based on characteristic of parts.

Characteristic and demands of situs testing

Characteristic of situs testing is at two sides, one is that workspace is little and it is its site condition is bad; the other is that the parts tested can't be separated, and testing means selected is limited. So it isn't as convenient as separate testing, but the later is easier to cause trouble and is not safety, and its working time is longer. Especially, sometimes this way isn't permitted. Such as, when we are having situs testing in airplane, it must firstly think of the space is good, that parts or structure are not separated. If it is easy to close according to the characteristic of the testing equipment and means, it can choose one or two testing means to need demands; If the space is too little to close, it should select testing side and think designing professional search-head , sometimes it can decompose some parts, such as bind-circle □air-month and oil-month. To parts, situs testing is used to inspect its fatigue cracks which are caused when they are us!

ing, so in the opinion, its characteristics also perform that testing aim is obviously -- tired cracks, its place is defined -- the area that is often stress bigger and it is often on surface, its discontinuities direction is defined -- their direction is often differ 90 degree from one of main stress. Usually, flaws generated in equipment structure and parts have recognized before testing. So in certain opinion situs testing is section test.

Situs testing should satisfied principles as follow:(1) Closed principle. Such as eddy current testing and ultrasonic testing, it must have testing side, which can place research-head to inspect engine leaf pieces, and have the road that can be in-watching. (2) Science principle. Situs testing means must be suitable, testing technology must be reasonable, and testing man must be professional. Such as radiography, the direction of perspective and scan are very important pars. (3) Advanced principle. It demands that instrument is good, without the advanced instrument situs testing can't have under many conditions, such as testing engine leaf-pieces, now we must use hole-testing instrument. (4) Wide principle. Situs testing equipment can be widely used. Such as, it can not only test parts of little size, but also inspect one of big size, and it can not only test

plane structure, but also test crack plane structure. (5) Reliable principle. The testing is according to situ!
s inspection technology whose result must be reliable, and its mistake must be little. So it demands good testing equipment□reasonable testing technology and skilled testing men. (6) Economics principle. That means it can gain reliable result in expense little. (7) Safety principle. Having situs testing, it must assure that testing men□ equipment and instrument are safe.
With the development of tiny electrical technique and the appearance of large scale integrated circuit, and using the advanced testing technique, aircraft situs testing is going to become more and more comprehensive□wide□ automation□little or light□digital□visual and intellectual. Aircraft will reality it's situs motionless and dynamic testing through ground-touch and plug-contact, its aim is that testing
itself state that will reality watching in time and right direction,
so its visual□ intellectual degree will be higher and better.

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