Choose And Use Describing StandardsOf Fault Diagnose Describing Model

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Abstract. As the nucleus of driving the fault diagnose' virtual simulation training and the semi-physical simulation training,Fault Diagnose Describing Model has been one of the hotpots nowadays. However, regarding the different machine different style fault diagnose, different machine same style fault diagnose even same machine same style fault diagnose, different researchers set up various Fault Diagnose Describing Models separately and describe them in various ways.This text will face the fault diagnose' virtual simulation training,analysis the essentials,levels and components of Fault Diagnose Describing Model,describe how to choose and use the describing standards and verify them as well, in this way,it provides the model supports for building a consolidative and integrated environment of maintenance training.It's quite important to the research on Fault Diagnose Describing Model.

1. Introduction

At present, there is no standard that can be referred directly in fault diagnose data description at home and abroad,but there are a lot of standards that are relevant to fault diagnose description tightly,mainly including S1000D standard and GJB6600 and ATML standard. Although the above standards are closely related to fault diagnose,they do not serve the the area of fault diagnose simulation training,S1000D standard and GJB6600 standard mostly serve in making IETM, ATML standard serves for area of automatic testing.S1000D standard has the independent data modules of fault classes which can be used in Fault diagnose Description,but these modules are too brief to describe fault detect,they can not describe the fault detection process referred to signal,what's more , the describing essentials mainly aim at requirements of making IETM,as a result, there are many limitations when these modules are applied to virtual simulation training and the semi- physical simulation training, they can not meet the training requirements completely; GJB6600 Standard also has the data modules of fault classes involved, it has the same shortage with the S1000D in the field of fault diagnose application; as the automatic testing standard, although ATML standard can not describe the process of fault diagnose completely,it can describe the fault diagnose process referred to testing signal. In order to satisfy the fault diagnose description referred to testing signal and meet the requirements of fault diagnose' simulation training,the Test description data module of ATML standard and fault data module are introjected,Test description is the supplement of fault data module of S1000D standard regarding the shortcomings on fault diagnose des--cription,meanwhile,fault data module will be replenished according to the simulation training requirements,fault diagnose describing model referred to testing signal will be built, at the same time , the fault diagnose describing model can be recognized by computers.

2. Fault diagnose describing model analysis

In order to meeting the fault diagnose requirements of simulation training aiming at mechanical

equipment and electronics, the building requirements of fault diagnose describing model can be generalized as followings:

(1)Module wholeness, it's to say that the module should include all essentials and attributes that meet the requirements of simulation training, it can realize the demand of fault diagnose' simulation training,this is the basic request to a module.

(2)Module rationality, it not only includes the reasonable size but also reasonable essentials and definition, this is the basic ensurance of getting a better simulated effect;

(3)Module Standard, it is to say that the module should try its best to abut against the relevant existed standard, in order to make the data easier to be transplanted and shared by a few modification which are built on the basis of international standard.

On the basis of the requirements on fault diagnose describing model,the essentials that the module needs to describe can be divided and showed as Figure1 in accordance with describing level.
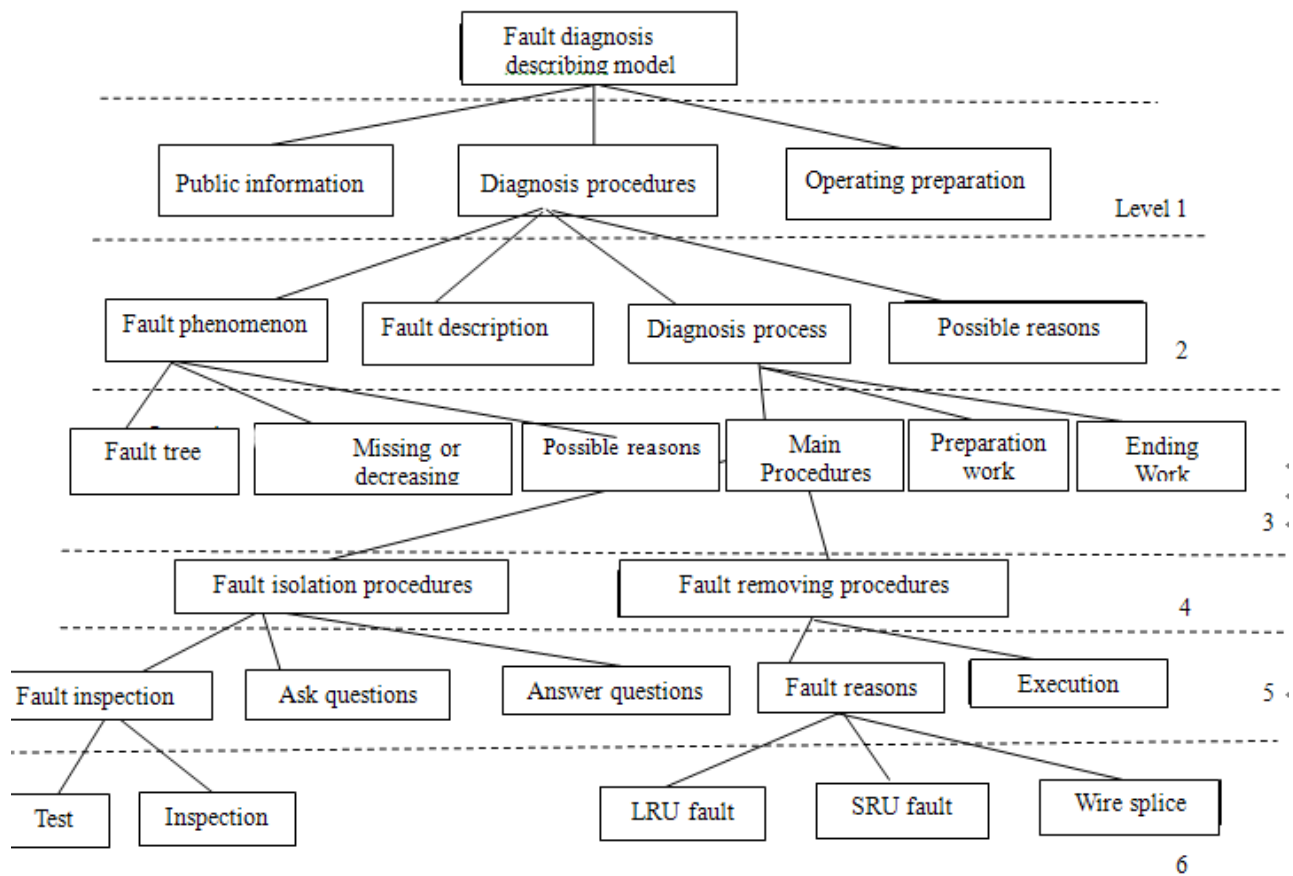

Fig.1 Describing Essential Level Structure of Fault diagnose Describing Model

According to the describing essential level relation of fault diagnose describing model,it can be known that the module's key essentials are fault phenomenon, diagnose process, possible reasons of fault,fault isolation procedures, fault inspection,fault removing and fault reasons,removing the non-key ones from the describing level structure picture,the key describing essential level structure can be shown as Figure2.
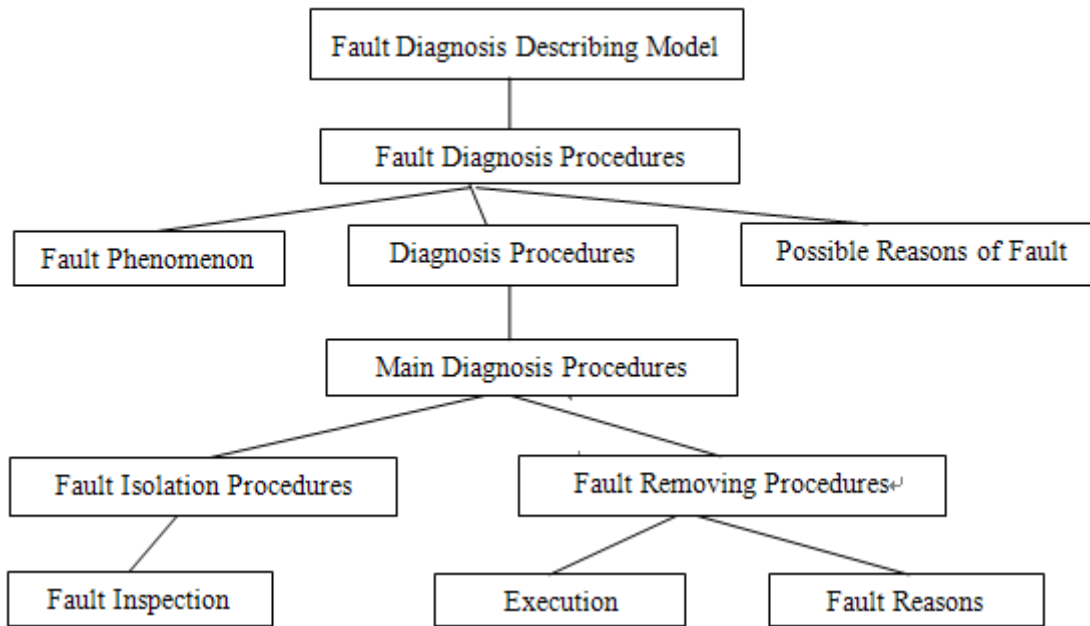
Fig.2 The key Describing Essential Level Structure of Fault diagnose Describing Model

The analysis of fault diagnose describing model's component elements are as following:

(1) fault diagnose describing model

Fault diagnose describing model is the start of fault phenomenon, diagnose procedures and fault reasons when build the describing model,its also the foothold as well,its mainly applied to the whole process when describing the fault diagnose. fault diagnose describing model not only includes the describing model of fault phenomenon, diagnose procedures and fault reasons but also includes the elements and attributes such as operation preparation and public information.

(2) fault phenomenon describing model

Fault phenomenon describing model is the module that is applied to describe the relevant information on all possible Fault Phenomenon of each signal product.it mainly describes the relevant information including Fault Phenomenon Code, name, appearance, fault tree, Missing or decreasing Function and Possible Reasons of Fault.

(3)diagnose   procedures describing model

Diagnose Procedures describing model is used for describe the fault inspection,fault isolation and fault removing in the process of fault diagnose,it's similar to describing the diagnose tree with the known diagnose strategy. The diagnose process is on the basis of fault phenomenon, confirm the fault inspection and fault isolation strategy according to the candidate sets of fault reason,meanwhile,based on the fault inspection results,the diagnose path will be traveled across, isolating the faults into the product levels which are required when executing the repair, then ,remove the faults.

(4)fault reason rescribing module

Fault reason describing module is mostly applied to describing the elements which caused the faults in the process of fault diagnose.fault reasons mainly include replaceable unit fault, wireways in outfield, replaceable unit fault in workshop and other fault reasons.

3.   Fault Diagnose Describing Standards' Choose and Use.

3.1 Fault Diagnose Describing Standards' Selection.

According to the analysis of fault diagnose describing model's building, the followings should be described :fault phenomenon,fault inspection, fault isolation, fault reason, missing or decreasing function, possible fault reason, fault parts, fault situation, operating preparation, fault removing,warning information, asking and answering questions,test description, test information in detail, interface information and signal information and so on.The fault data modules of S1000D

standard and GJB6600 standard have most of essentials involved that should be described necessarily,，ATML standard also has some of the essentials, at the same time,it also includes the essentials which the above standards do not have.The specific corresponding relations between describing essentials are shown as following form3-1,"√"means to have this describing essentials,"×" means no:

Table1 The corresponding relations among essentials and S1000D/GJB6600 Standard and ATML Standard

Essentials that should be described	S1000D/GJB6600		ATML	
	Existing	Corresponding Node	Existing	Corresponding Node
Fault phenomenon	×	×	×	×
Fault Inspection	√	action、note、Fmft Elem Group	√	Actions、Test Groups
Fault Isolation	√	Isolation Step	×	Test Description
Fault Reason	×	×	√	Failures、Faults
Missing or Decreasing Function	×	×	×	×
Possible Fault Reason	√	Possible Cause Group	√	Failures、Faults
Fault Parts	√	lru、sru、Wiring Possible Cause	√	Components
Fault Situation	×	×	×	×
Operating Preparation	√	Preliminary Rqmts	√	Power Requirements、Special Tools
Fault Removing	√	Isolation Procedure End	√	Repair
Warning Information	√	warning、caution	√	Safety
Asking Questions	√	Isolation Step Question	×	×
Answering Questions	√	Isolation Step Answer	√	Results
Test Description	×	×	√	Test Description
Test Description in Details	×	×	√	Detailed Test Information
Interface Information	×	×	√	Interface Requirements

According to the describing essentials existing or not in the S1000D/GJB660 and ATML standard,we can summary three relationships between them: both having, none having and one of them having. On the basis of test description use standard in building standard and the elements' existing relations in the above standards, the corresponding describing essentials' use standards are as following:

(1)The describing essentials exist both in S1000D/GJB6600 and ATML. In such situation, these essentials mainly refer to S1000D/GJB6600 Standard, considering these essentials' describing manners of ATML adequately. They can be modified on the basis of S1000D Standard but no modification on the basis of ATML Standard.

(2)The describing essentials do not exist both in S1000D/GJB6600 and ATML. In such situation, the corresponding essentials should be added on the basis of S1000D Standard according to the requirements of module building.

(3)The describing essentials do exist in S1000D/GJB6600 but not in ATML. In such situation, these essentials should refer to the S1000D/GJB6600 Standard, they can be modified on the basis of S1000D.

(4)The describing essentials do exist in ATML but not in S1000D/GJB6600. In such situation,

these essentials should refer to ATML Standard,they can be modified on the basis of S1000D.

Although some of describing essentials exist in above standards, parts of them are described quite briefly,they can not meet the requirements of fault diagnose′ simulation training. at this time, building new ones and replenishing the describing essentials are demanded. For example, in ATML ,the describing nodes of fault reason are "Failures"and "Faults", however, these descriptions of fault reasons are too brief to satisfy the describing requirements of module, at this moment, the new describing essentials of fault reason can be built to describe the fault reason.

In summary,fault diagnose describing model will mainly refer to the "Fault" Data Module of S1000D Standard, secondly referred to Fault Data Module of GJB6600 Standard, meanwhile, the Test Description of ATML Standard are introjected into the "Fault" Data Module of S1000D Standard, the essentials which can not satisfy the describing requirements will be expanded, the inexistent describing essentials and attributes will be added , in this way, the building of fault diagnose describing model will be accomplished.

3.2The conflict handling of fault diagnose

Describing standards SI000D and ATML Standard are both treat the XML language as the describing language, and treat the XML schema as the data describing regulations. Because the ATML standard limits the essentials by the way of naming space, there is no conflict among the essentials when the S1000D standard is introjected with ATML Standard, However, there are conflicts in attributes, what′ s more, there may be conflicts of naming essentials when we add the new essentials on the basis of S100D standard,as a result, the modules do not conform to the grammar.

When conflict happens, if it does not influence the module′ s analysis and execution, no action will be taken regarding the conflict. For example, it usually names the essentials with simplifying technical English in S1000D Standard, when naming the essentials, all letters of the first word are in lowercase, the first letter of the other word (not the first word) is in uppercase, except this,the rest letters are all in lowercase. According to naming regulations of simplifying technical English, attribute naming is id in S1000D ,but in ATML , it is ID, it conflicts to the naming manners in S1000D. However, it does not influence the module′ s analysis and execution and no action will be taken.

When conflict happens, if it will influence the module′ s analysis and execution, regarding the conflicting parts of new-added essentials, the existing essentials in S1000D and ATML will be taken as the standard to modify the conflict parts. For example,in the proces of the possible fault reason "possible Cause Group" and new-added fault reason "fault Cause" , these two essentials are both used in describing different styles of fault reason, but they have different meaning separately, in order to avoiding the naming conflicts, we name the possible fault reason " possible Cause Group"′ s subsidiary node as " lru, wiring Possible Cause, other Possible Cause and sru", fault reason"fault Cause"′ s subsidiary node as "lru Cause, wiring Cause, other Cause and sru Cause".

4.   Example application

This paper will take the example of fault diagnose that a certain model hydraulic jack can not accomplish the recycling completely, firstly, the main reasons maybe steel wire cracking and recycling spring cracking ,its Diagnose tree is shown as figure3 :
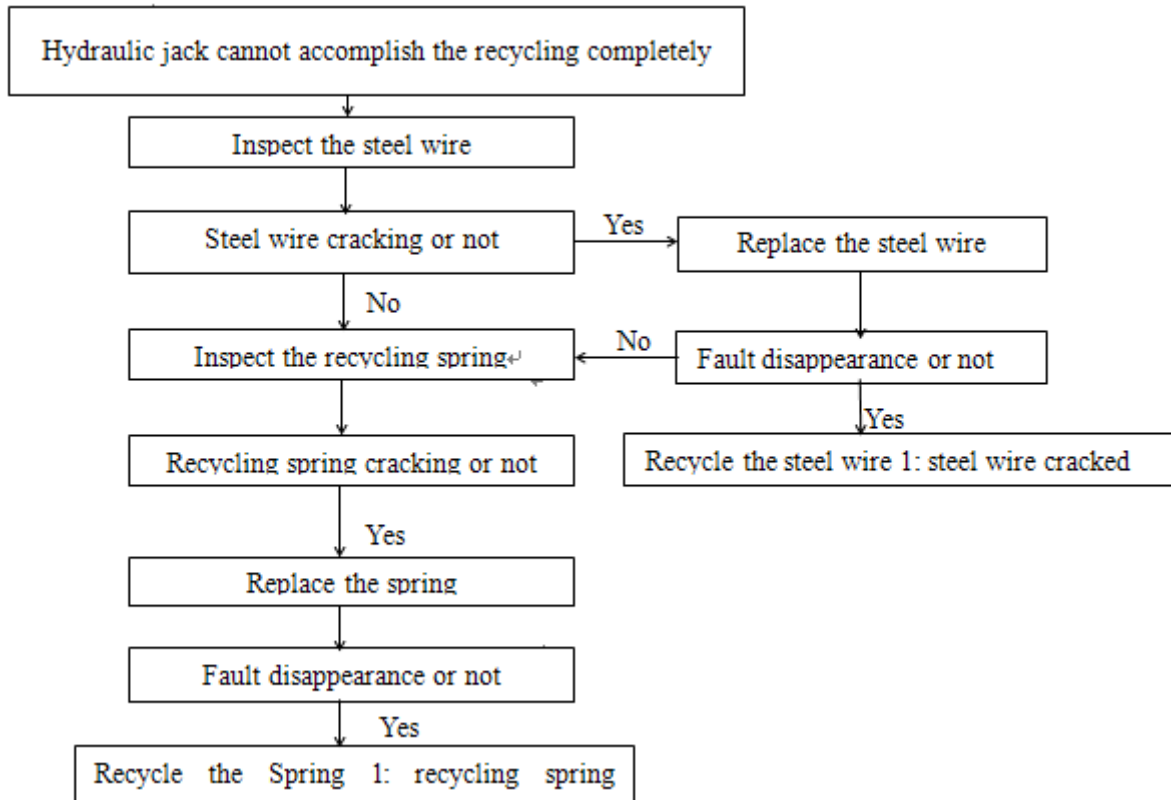
Fig.3 Fault Diagnose tree of hydraulic jack can not accomplish the recycling completely

According to the XML Schema definition of fault diagnose' virtual simulation training module, the XML language of this example is as following(due to limited space,a part of describing content was omitted):

```xml
<?xml version="1.0" encoding="UTF-8"?>
<FaultDiagnose>
    <FaultInformation>
        <FaultPhenomena name
            <Content    name=   location="Left"   path="Contents\Ngrain\.3ko"   BehaveType="Animation"
ContentType="3ko" animationName= currentConfiguration="Defaut" beginTime="0" endTime="20" />
        </FaultPhenomena>
        <DiagnoseTree name= path="Contents\FaultControl \Flow.xml" location="Left" />
        <FaultReasons>
            <FaultReason id="01" name="ID0001-0012-0056:WSF1" routeCode          <FaultReason
id="02" name="ID0001-0012-0040:WSF1" routeCode       </FaultReasons>          </FaultInformation>
    <Steps>
......
        <TestNode      id="4"      name      CellId="ID0001-0012-0040"      Mark="0"      Judge=""
stepPath="Contents\FaultControl
            <PrevSteps>
                <PrevStep id="2" />
            </PrevSteps>
            <NextSteps>
                <NextStep id="" />
            </NextSteps>
            <Contents>
                <Content name path="Contents\Ngrain3ko" ContentType="3ko" BehaveType="Animation"
location="Left" animationName currentConfiguration="Defaut" beginTime="6" endTime="34" Text="" />
            </Contents>
            <Details />
            <Help />
            <Datum />
    </ TestNode>            <RepairNode id="5"  name CellId="ID0001-0012-0040" Mark="" Judge=""
```

stepPath="">   ······
          </ RepairNode>   </Steps>
</FaultDiagnose>

5. Conclusion

　　Researching and building the fault diagnose describing modules facing the training can be used in driving the fault diagnose＇virtual simulation training and the semi- physical simulation training, it will improve the maintenance staff＇s knowledge level and ability of fault diagnose, as a result, the rate of equipment in good condition will be ensured.This text has analyzed the building requirements of fault diagnose describing model, crystalized the language of building model, completed the selection and handling of describing standard on the basis of S1000D,GJB660 and ATML Standards and researched the training technical based on the fault diagnose describing model.

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