T E C H N I C A L R E P O R T
T U B E T E S T I N G

Vejen Vaerme A/S

Koldingvej heatplant

Object: Boiler

Report No:
Revision No:

Report No: WO-00536642-35 Revision No:

Customer
Vejen Varme A/S

Koldingvej 30B
DK-6600 Vejen

Our comm No

Löfberg Per/23/11/2017 20:50

Customer reference
Erik Jensen/Peder Andersen

Order No
-

Test object

Location of testing			Object name/No		
Koldingvej Heatplant			Boiler		
	Material	Length	Outer diameter	Inner diameter	Wall thickness
Tube type 1	Carbonsteel	Approx 5000mm	88,9mm	82,5mm	3,2mm
Tube type 2	Duplex 1.4462	Approx 5000mm	60,3mm	54,76mm	2,77mm
Tube type 3					
Tube type 4					

Test equipment

Tube testing system		PCI card	Eddy Current method
Multifrekvent EC		20139039 08A	Tubemax
Computer		Software	Software version
"The Box" ID:7037		WinDevos	4.10.02.09
Probe adapter	Power supply	Remote Field Power Unit	Remote Field Channel Multiplexer Unit
Box 1			

Other equipment 1	Other equipment 2	Other equipment 3
Other equipment 4	**Other equipment 5**	**Other equipment 6**

Probe tube type	Eddy Current method	Diameter	Inspecta No	Manufacturer	Supplementary data
DA-T-ID	TubeMax	58,0mm	E11	TMT	Segmentated
DA-T-ID	TubeMax	48,0mm	E2	TMT	Segmentated

Report No: Revision No:

Reference

Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
	CS	70,0mm	63,6mm	3,2mm
Inspecta No	Reference defects			
-	Gradual thinning 0-80%, (wrong dimension, but right thickness)			
Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
	Duplex 1.4462	60,3mm	54,76mm	2,77mm
Inspecta No	Reference defects			
-	Gradual thinning 0-80%, (from other objects at the client)			
Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
Inspecta No	Reference defects			
Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
Inspecta No	Reference defects			
Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
Inspecta No	Reference defects			
Tube type No	Material	Outer diameter	Inner diameter	Wall thickness
Inspecta No	Reference defects			

Test data

Test according to	Procedure, rev
	TI: 5203-00 (Absolute testing)

Extent of examination

100% inspection of boiler in Vejen Heating plant.

The boiler had 579pcs of duplex tubes and 233pcs of CS tubes were inspected, accept for 6 tubes that was blocked by dirt inside in the tubes.

Examination result

Testing result of boiler is as follows.

Out of totally 812 tubes we inspected 806 tubes.
6 tubes was blocked this are marked with (B) on the tube sheet, the reason for that was that the tubes were dirty inside this make a totally of 0,7% that wasn´t tested according to the plan.
2 tubes were plugged from before this tubes are marked with (P) on the tube sheet.
The carbonsteel have big both local and overall indications of gradual thinning, the recommendation is to plug all indication from 5 and above.
And also do a retest after 1-2 year to see the progress of the tube condition if it´s groving or if the reising of the return temperatur has done it´s job.

(For more information also see point 11 and appendix).

Inspecta Sweden AB

Reviewed by (if applicable) Sign/No	Sign responsible person	Date	
	Per Löfberg	2018-08-24	
	Name in print	Certified according to	Level
	Per Löfberg & Tony Lehnert	EN 9712	II

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1 TESTING ASSIGNMENT

The object was tested in accordance with the client using the eddy current method eddyMax™.

2 EDDYMAX™ - INFORMATION ABOUT THE METHOD

The eddyMax™ method is based upon the principle of eddy current. Eddy currents are created through a process called electromagnetic induction. When alternating current is applied to the conductor, such as copper wire, a magnetic field develops in and around the conductor. If another electrical conductor is brought into the close proximity to this changing magnetic field, current will be induced in this second conductor, for example a tube. Eddy currents are induced electrical currents that flow in a circular path and irregularities such as material loss in the tube affects the currents creating a signal that is registered by the eddyMax™ system.

The amplitude and phase of that signal is then analyzed and compared to the amplitude and phase of a defect from a reference tube. Using that information an assessment can be made about spreading and depth of the found defect.

There are primarily three different eddyMax™ systems used in this method. This is because the three systems are designed for different types of tubes and testing conditions:

2.1 Multiple Freq. Eddy Current - D-B-ID – for non-ferromagnetic tubes

This system uses the differential and absolute channels and can indicate both local defects and gradual wall thinning. Examples of common industrial non-magnetic materials suitable for this method are stainless steel, copper, copper-nickel, brass and titanium.

Advantages include high test speed, high sensitivity and detail of the indicator evaluation and the ability to use automated probe handling for increased accuracy in positioning of defects (so-called push-puller).

2.2 Multiple Freq. Eddy Current Magnetic Biased – D-B-IDMA - for ferromagnetic tubes

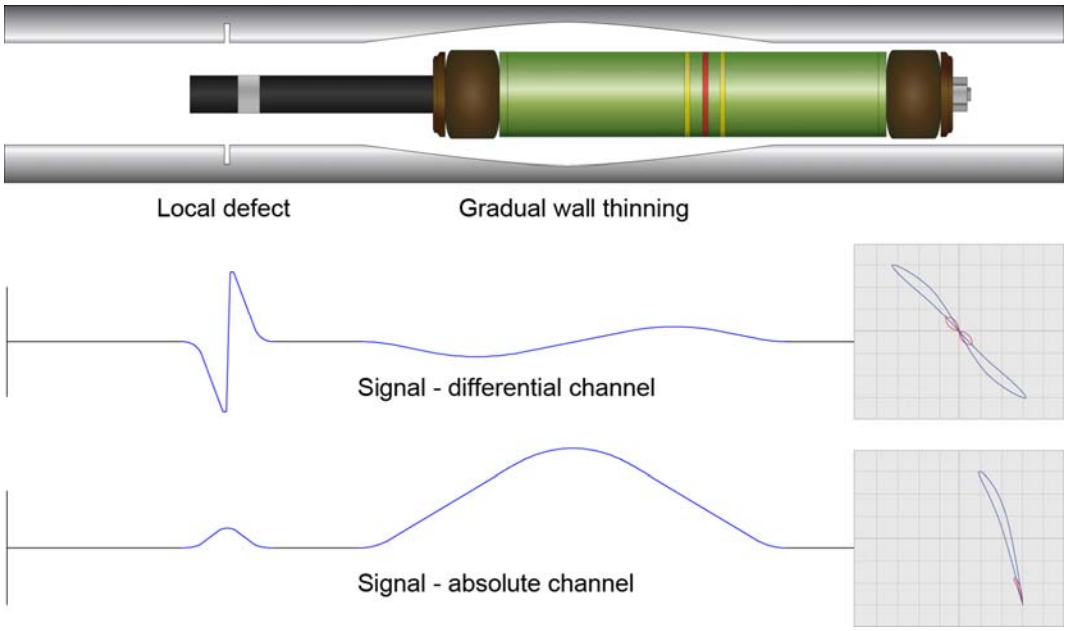
This is a system for testing ferromagnetic tubes that use direct current for material magnetisation of the tube together with eddy current based on the principle above. The system mainly uses differential channels and is therefore primarily used to evaluate local irregularities such as vibration damage to support plates.

2.3 Remote Field Eddy Current – DA-T-ID – for ferromagnetic tubes

This is a system for testing ferromagnetic tubes that instead of magnetisation is based upon low-frequency eddy current. It uses both differential and absolute channels and can detect both gradual wall thinning and local defects, provided that the test speed is low enough.

Compared to Eddy Current Magnetic Biased a larger amount of different types of defects can be detected but disadvantages include lower test speed and in some cases difficulty to detect local irregularities such as vibration damage to support plates.

The illustration below show the signal difference from a Multiple Frequency Eddy Current-probe passing a local defect and a gradual wall thinning defect on the differential channel and the absolute channel:



3 TESTING CONDITIONS AND LIMITATIONS

Some inevitable testing limitations exist. These include the bend in the U-tubes, twisted tubes (in the majority of cases when not using a flexible probe) and the area of the tube attached to the tube sheet.

Test quality is directly dependent on how similar the reference tube is to the test piece considering material properties and dimensions. The goal is to always use a reference tube that is as close to authentic as possible and in the same condition as the tube to be tested. The reference tube should also have artificial defects according to a standard that makes it possible to detect the type of defects that are suspected in the tubes being tested.

The filling factor, the difference between the tube inner diameter and the probe diameter, should be as small as possible for the most accurate testing results.

Cleaning the tubes is also crucial for the test quality. In addition to having to use probes with lower filling factor, magnetite and other magnetic impurities in the tubes result in a poor signal to noise ratio, lowering the accuracy of the testing.

Several of these points lie under the clients own responsibility - it is important that the tubes are well prepared, thoroughly cleaned with an appropriate method and dried up before the testing. It is also important that the specified dimensions, materials and blueprints match the actual test object in order to achieve the highest possible quality of testing.

4 CALIBRATION

4.1 Non-ferromagnetic tubes - Multiple Frequency Eddy Current

The frequency is adjusted so that the signal to noise ratio is as good as possible while an optimal difference in phase between the external defects, the drilled hole and the internal defects is maintained.

4.2 Ferromagnetic tubes - Multiple Frequency Eddy Current Magnetic Biased

An adequate frequency, gain and level of magnetisation is chosen so that the cross-sectional area of the tube is penetrated completely by the eddy currents. The frequency is then, if possible, adjusted so that the signal to noise ratio is as good as possible while an optimal difference in phase between the external defects, the drilled hole and the internal defects is maintained.

4.3 Ferromagnetic tubes - Remote Field Eddy Current

The frequency is chosen so that the cross-sectional area of the tube is penetrated completely by the eddy currents while an optimal difference in phase between the external defects, the drilled hole and the internal defects is maintained.

5 DEFECT CLASSES AND SENSITIVITY SETTINGS

The overview of the tube sheet in the final result portion of the report is presented using defect classes separated by colour. These classes represent levels of material-loss compared to nominal thickness on a scale between 0 and 9 according to the scale below:

internal defects		external defects	
1	10 % - 19 %	1	10 % - 19 %
2	20 % - 29 %	2	20 % - 29 %
3	30 % - 39 %	3	30 % - 39 %
4	40 % - 49 %	4	40 % - 49 %
5	50 % - 59 %	5	50 % - 59 %
6	60 % - 69 %	6	60 % - 69 %
7	70 % - 79 %	7	70 % - 79 %
8	80 % - 89 %	8	80 % - 89 %
9	90 % - 100 %	9	90 % - 100 %

·	No defect
D	Dent
N	Not decideable
P	Plug
B	Blocked

The scale represents percent of material loss compared to nominal thickness. It is also separated by internal defects (round tube) and external defects (square tube) as well as other classifications such as Dent, Not Decidable, Plugged and Blocked.

6 MANAGING THE PROBE

The technician operating the probe is responsible for positioning, pushing/pulling of the probe and that the recording of signals is done in accordance with the EddyMax-operator and in the same way that it is prepared for in the software.

The pushing and pulling of the probe is either done manually or by using an electronically powered Push-Puller. The use of a Push-Puller increases the accuracy in positioning of found defects and in some cases increases the speed of testing. It is, however, in most cases only possible during testing of clean non-ferromagnetic tubes using the D-B-ID method.

7 STORAGE OF PARAMETERS

The EC-parameters are adjusted during calibration and stored digitally according to a predetermined naming-pattern.

8 VERIFICATION OF CALIBRATION

The calibration is made prior to the start of the actual testing. The calibration settings are then verified in the end of each shift, after changing equipment components or when changes are made to the equipment settings.

The calibration is generally based on an external reference meaning that a final adjustment of the calibration and sensitivity settings only can be made after a defect has been detected, pulled out of the test object and verified.

9 ANALYSIS OF INDICATIONS

All indications which have a clear phase and amplitude comparable to the defects in the reference tube are reported.

Indications clearly out of the damage phase compared to the reference defects are not reported.

10 REPORT OF FOUND INDICATIONS

Reporting of found indications is created using documentation features of the eddyMax/tubeMax software.

11 TESTING RESULTS

Testing result of boiler is as follows.

Out of totally 812 tubes we inspected 806 tubes.
6 tubes was blocked this are marked with (B) on the tube sheet, the reason for that was that the tubes were dirty inside this make a totally of 0,7% that wasn´t tested according to the plan.
2 tubes were plugged from before this tubes are marked with (P) on the tube sheet.
The carbonsteel have big both local and overall indications of gradual thinning, the recommendation is to plug all indication from 5 and above.
And also do a retest after 1-2 year to see the progress of the tube condition if it´s groving or if the reising of the return temperatur has done it´s job.

Statistic results

Indicationsclass	Indicationsdepht	No of tubes
7	70 – 79 %	1
5	50 – 59 %	2
4	40 – 49 %	34
3	30 – 39 %	111
2	20 – 29 %	151
1	10 – 19 %	93
NI	0 – 9 %	412

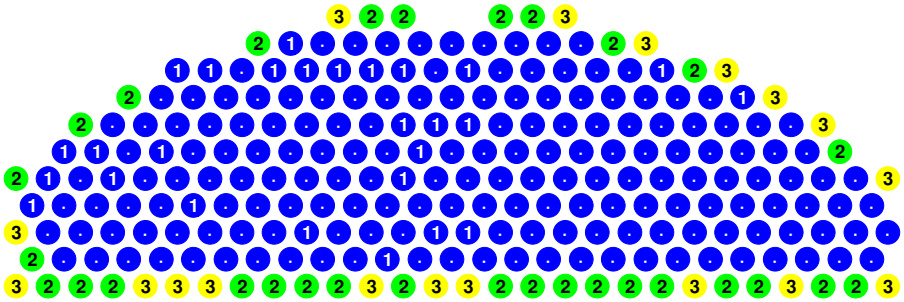
Totally approx 99,8 % tubes were tested

12 ATTACHMENTS

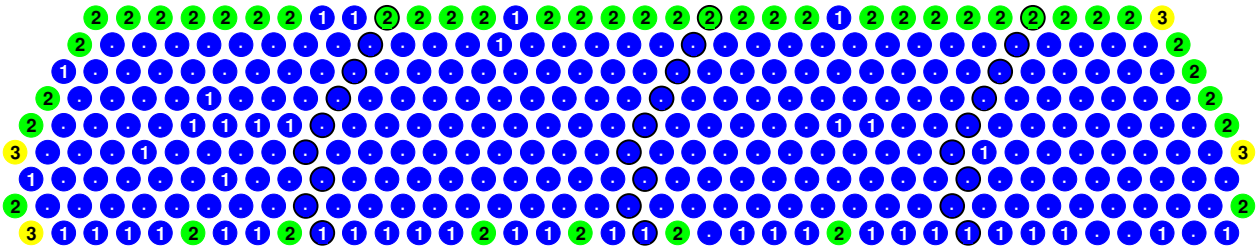
1) eddyMax® Defect Picture Boiler Total
2) eddyMax® Statistic Boiler Total
3) eddyMax® Defect Picture Boiler (Part1 CS)
4) eddyMax® Statistic Boiler (Part1 CS)
5) eddyMax® Defect Picture Boiler (Part2 Duplex)
6) eddyMax® Statistic Boiler (Part2 Duplex)
7) eddyMax® Defect Picture Boiler (Part3 Duplex)
8) eddyMax® Statistic Boiler (Part3 Duplex)

Boiler
Defect Picture
final result

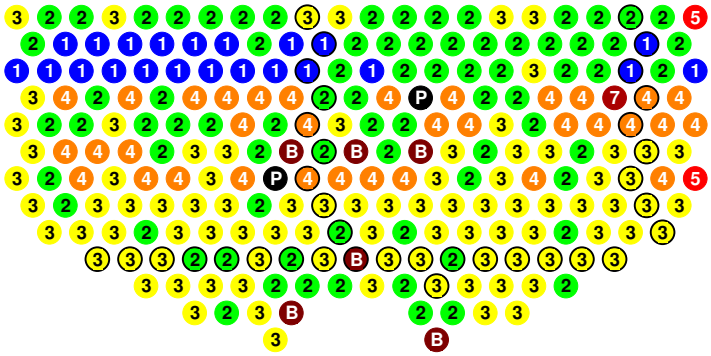
Part 3



Part 2



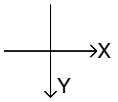
Part 1



internal defects		external defects	
1	10 % - 19 %	1	10 % - 19 %
2	20 % - 29 %	2	20 % - 29 %
3	30 % - 39 %	3	30 % - 39 %
4	40 % - 49 %	4	40 % - 49 %
5	50 % - 59 %	5	50 % - 59 %
6	60 % - 69 %	6	60 % - 69 %
7	70 % - 79 %	7	70 % - 79 %
8	80 % - 89 %	8	80 % - 89 %
9	90 % - 100 %	9	90 % - 100 %

- No defect
- D Dent
- N Not decideable
- P Plug
- B Blocked

view : Top
Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex



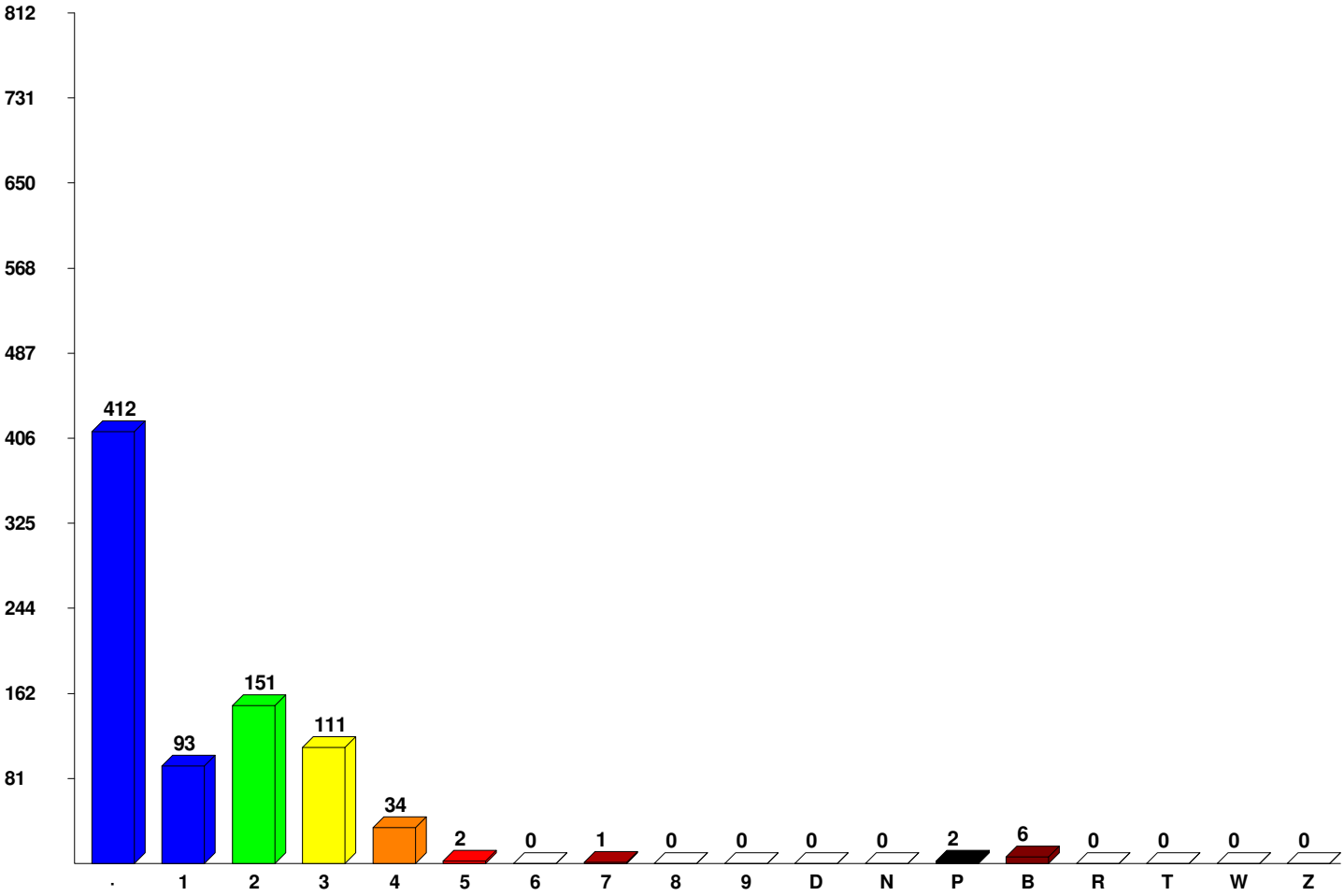
- R Provad UA (Plugg)
- T Var pluggad 2009
- W W
- Z Z
- Tube not to be inspected
- Tube to be inspected

kiwa

subject	: Boiler
page(s)	: all
client	: Vejem Vaerne AS
site	: Vejen varnevaerk
order-no.	:
K.-No.	:
Date	: 2018-08-23
Material	: 1.4462 Duplex
length of leg	: 5400 mm
Ø External	: 60,30 mm
Ø Internal	54,76 mm
Wall thickness	: 2,77 mm

WinDevos Ver. 2.12.05 build 1412

Boiler - Statistic
final result - all section
(all tubes)



[1] :	**all tubes**		**812**		
[2] :	**all tubes with indication**		**398**	**49,0% from [1]**	
[3] :	**all inspected tubes**		**810**	**99,8% from [1]**	
internal defects		**number**	**% [1]**	**% [2]**	**% [3]**
1	10 % - 19 %	93	11,5	23,4	11,5
2	20 % - 29 %	151	18,6	37,9	18,6
3	30 % - 39 %	111	13,7	27,9	13,7
4	40 % - 49 %	34	4,2	8,5	4,2
5	50 % - 59 %	2	0,2	0,5	0,2
6	60 % - 69 %	0	0,0	0,0	0,0
7	70 % - 79 %	1	0,1	0,3	0,1
8	80 % - 89 %	0	0,0	0,0	0,0
9	90 % - 100 %	0	0,0	0,0	0,0
external defects		**number**	**% [1]**	**% [2]**	**% [3]**
1	10 % - 19 %	0	0,0	0,0	0,0
2	20 % - 29 %	0	0,0	0,0	0,0
3	30 % - 39 %	0	0,0	0,0	0,0
4	40 % - 49 %	0	0,0	0,0	0,0
5	50 % - 59 %	0	0,0	0,0	0,0
6	60 % - 69 %	0	0,0	0,0	0,0
7	70 % - 79 %	0	0,0	0,0	0,0
8	80 % - 89 %	0	0,0	0,0	0,0
9	90 % - 100 %	0	0,0	0,0	0,0
		number	**% [1]**	**% [2]**	**% [3]**
·	No defect	412	50,7		50,9
D	Dent	0	0,0	0,0	0,0
N	Not decideable	0	0,0	0,0	0,0
B	Blocked	6	0,7	1,5	0,7
P	Plug	2	0,2		
	Tube not to be inspected	0	0,0		
	Tube to be inspected	0	0,0		
R	Provad UA (Plugg)	0	0,0	0,0	0,0
T	Var pluggad 2009	0	0,0	0,0	0,0
W	W	0	0,0	0,0	0,0
Z	Z	0	0,0	0,0	0,0
V	To be plugged	1	0,1		
X	Extra to be plugged	0	0,0		

subject : Boiler
section : all
client : Vejem Vaerne AS
site : Vejen varnevaerk
order-no. :
K.-No. :
Date : 2018-08-23
Material : 1.4462 Duplex
Tube length : 5400 mm
Ø External : 60,30 mm
Ø Internal 54,76 mm
Wall thickness : 2,77 mm
WinDevos Ver. 2.12.05 build 1412

test parameter
Operator : PL / TL
equipment : TMT eddyMax
Probe type : Segmented RFT
Cal. Tube : Authentic Tube
Cal. Defect : AVH 0-80%

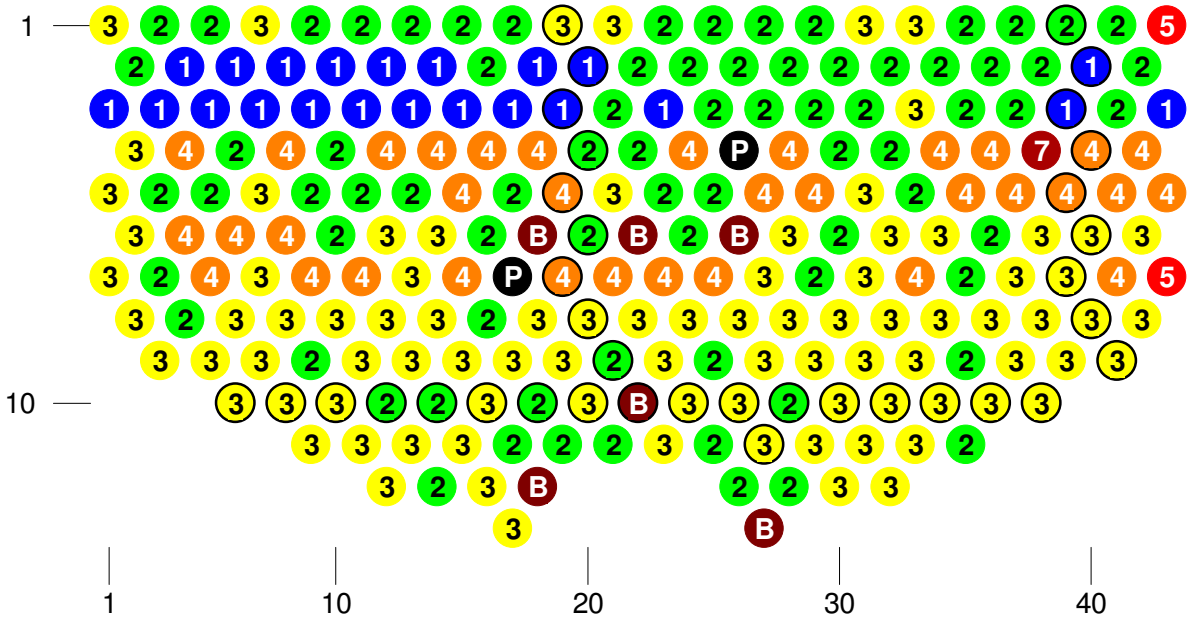
Plug criteria
internal defects From: 70%
external defects From: 70%

updated:
plugged tubes: 3 0,4%
available tubes: 809 99,6%

Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex

Boiler
Defect Picture
final result

Part 1



internal defects		external defects	
1	10 % - 19 %	1	10 % - 19 %
2	20 % - 29 %	2	20 % - 29 %
3	30 % - 39 %	3	30 % - 39 %
4	40 % - 49 %	4	40 % - 49 %
5	50 % - 59 %	5	50 % - 59 %
6	60 % - 69 %	6	60 % - 69 %
7	70 % - 79 %	7	70 % - 79 %
8	80 % - 89 %	8	80 % - 89 %
9	90 % - 100 %	9	90 % - 100 %

- No defect
- D Dent
- N Not decideable
- P Plug
- B Blocked

view : Top
Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex

X
Y

- R Provad UA (Plugg)
- T Var pluggad 2009
- W W
- Z Z
- Tube not to be inspected
- Tube to be inspected

subject	: Boiler
page(s)	: 1 from 3
client	: Vejem Vaerne AS
site	: Vejen varnevaerk
order-no.	:
K.-No.	:
Date	: 2018-08-23
Material	: P235GH
length of leg	: 5400 mm
Ø External	: 88,90 mm
Ø Internal	: 82,50 mm
Wall thickness	: 3,20 mm

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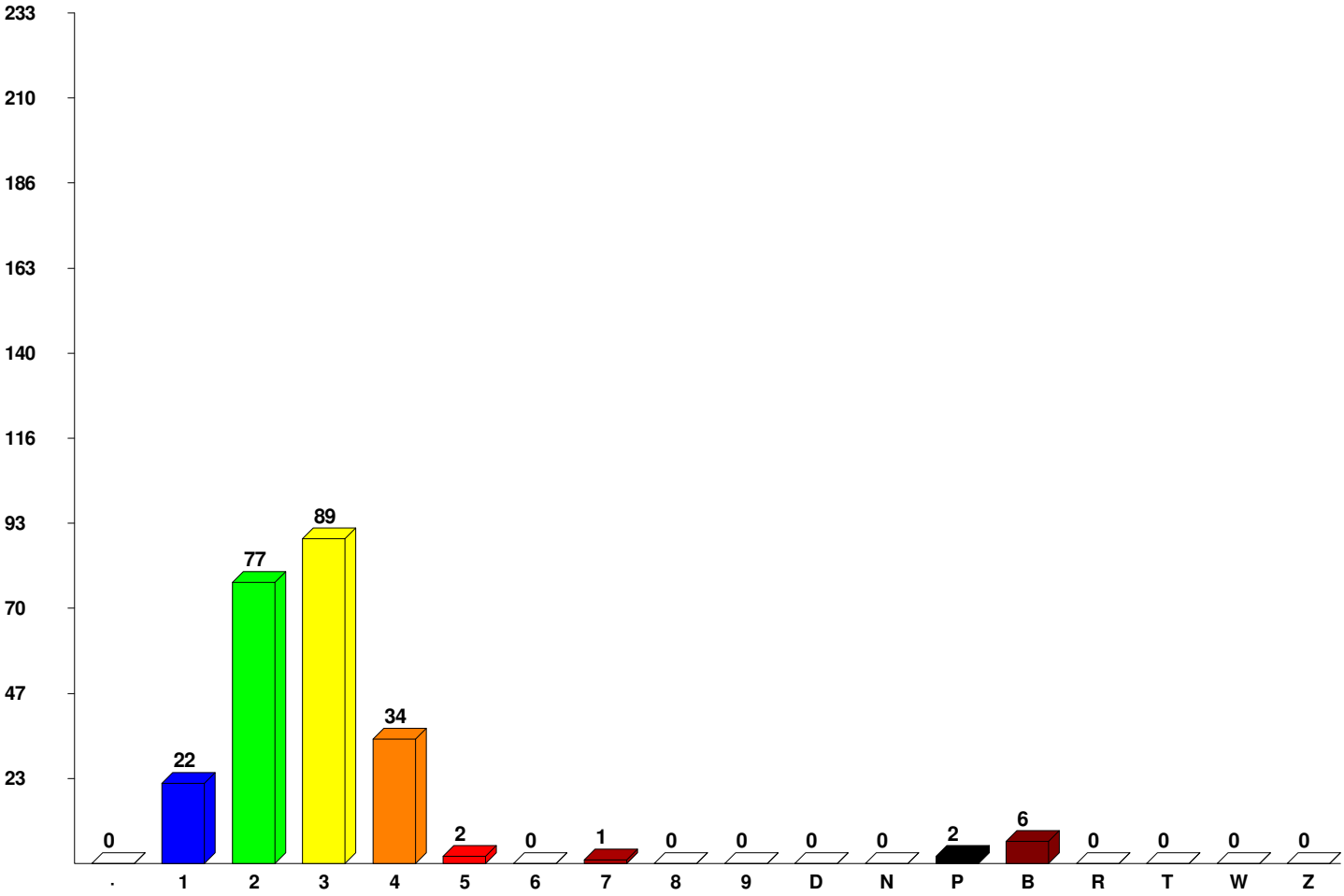
Boiler - Part 1 - Statistic
final result - Part 1
(all tubes)



[1] :	**all tubes**	**233**		
[2] :	**all tubes with indication**	**231**	**99,1% from [1]**	
[3] :	**all inspected tubes**	**231**	**99,1% from [1]**	
internal defects	**number**	**% [1]**	**% [2]**	**% [3]**
1 10 % - 19 %	22	9,4	9,5	9,5
2 20 % - 29 %	77	33,0	33,3	33,3
3 30 % - 39 %	89	38,2	38,5	38,5
4 40 % - 49 %	34	14,6	14,7	14,7
5 50 % - 59 %	2	0,9	0,9	0,9
6 60 % - 69 %	0	0,0	0,0	0,0
7 70 % - 79 %	1	0,4	0,4	0,4
8 80 % - 89 %	0	0,0	0,0	0,0
9 90 % - 100 %	0	0,0	0,0	0,0
external defects	**number**	**% [1]**	**% [2]**	**% [3]**
1 10 % - 19 %	0	0,0	0,0	0,0
2 20 % - 29 %	0	0,0	0,0	0,0
3 30 % - 39 %	0	0,0	0,0	0,0
4 40 % - 49 %	0	0,0	0,0	0,0
5 50 % - 59 %	0	0,0	0,0	0,0
6 60 % - 69 %	0	0,0	0,0	0,0
7 70 % - 79 %	0	0,0	0,0	0,0
8 80 % - 89 %	0	0,0	0,0	0,0
9 90 % - 100 %	0	0,0	0,0	0,0
	number	**% [1]**	**% [2]**	**% [3]**
· No defect	0	0,0		0,0
D Dent	0	0,0	0,0	0,0
N Not decideable	0	0,0	0,0	0,0
B Blocked	6	2,6	2,6	2,6
P Plug	2	0,9		
Tube not to be inspected	0	0,0		
Tube to be inspected	0	0,0		
R Provad UA (Plugg)	0	0,0	0,0	0,0
T Var pluggad 2009	0	0,0	0,0	0,0
W W	0	0,0	0,0	0,0
Z Z	0	0,0	0,0	0,0
V To be plugged	1	0,4		
X Extra to be plugged	0	0,0		

kiwa

subject : Boiler
section : Part 1
client : Vejem Vaerne AS
site : Vejen varnevaerk
order-no. :
K.-No. :
Date : 2018-08-23
Material : P235GH
Tube length : 5400 mm
Ø External : 88,90 mm
Ø Internal : 82,50 mm
Wall thickness : 3,20 mm
WinDevos Ver. 2.12.05 build 1412

test parameter
Operator : PL / TL
equipment : TMT eddyMax
Probe type : Segmented RFT
Cal. Tube : Authentic Tube
Cal. Defect : AVH 0-80%

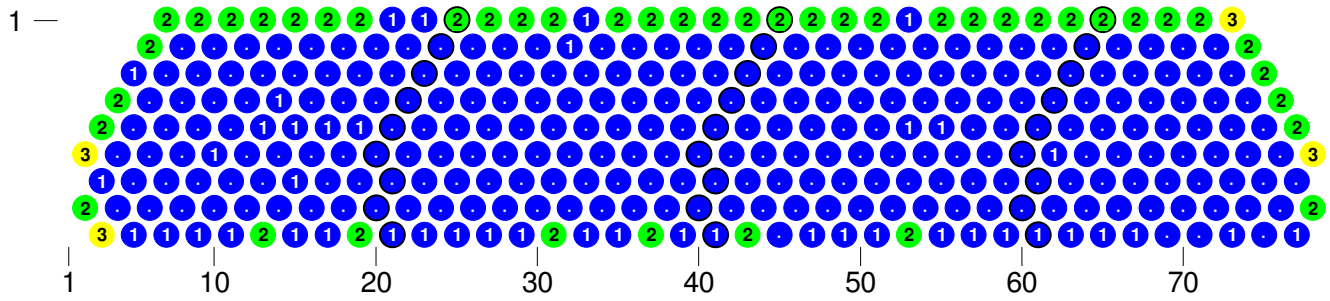
Plug criteria
internal defects From: 70%
external defects From: 70%

updated:
plugged tubes: 3 1,3%
available tubes: 230 98,7%

Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex

Boiler
Defect Picture
final result

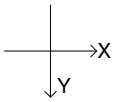
Part 2



internal defects		external defects	
1	10 % - 19 %	1	10 % - 19 %
2	20 % - 29 %	2	20 % - 29 %
3	30 % - 39 %	3	30 % - 39 %
4	40 % - 49 %	4	40 % - 49 %
5	50 % - 59 %	5	50 % - 59 %
6	60 % - 69 %	6	60 % - 69 %
7	70 % - 79 %	7	70 % - 79 %
8	80 % - 89 %	8	80 % - 89 %
9	90 % - 100 %	9	90 % - 100 %

- No defect
- D Dent
- N Not decideable
- P Plug
- B Blocked

view : Top
Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex



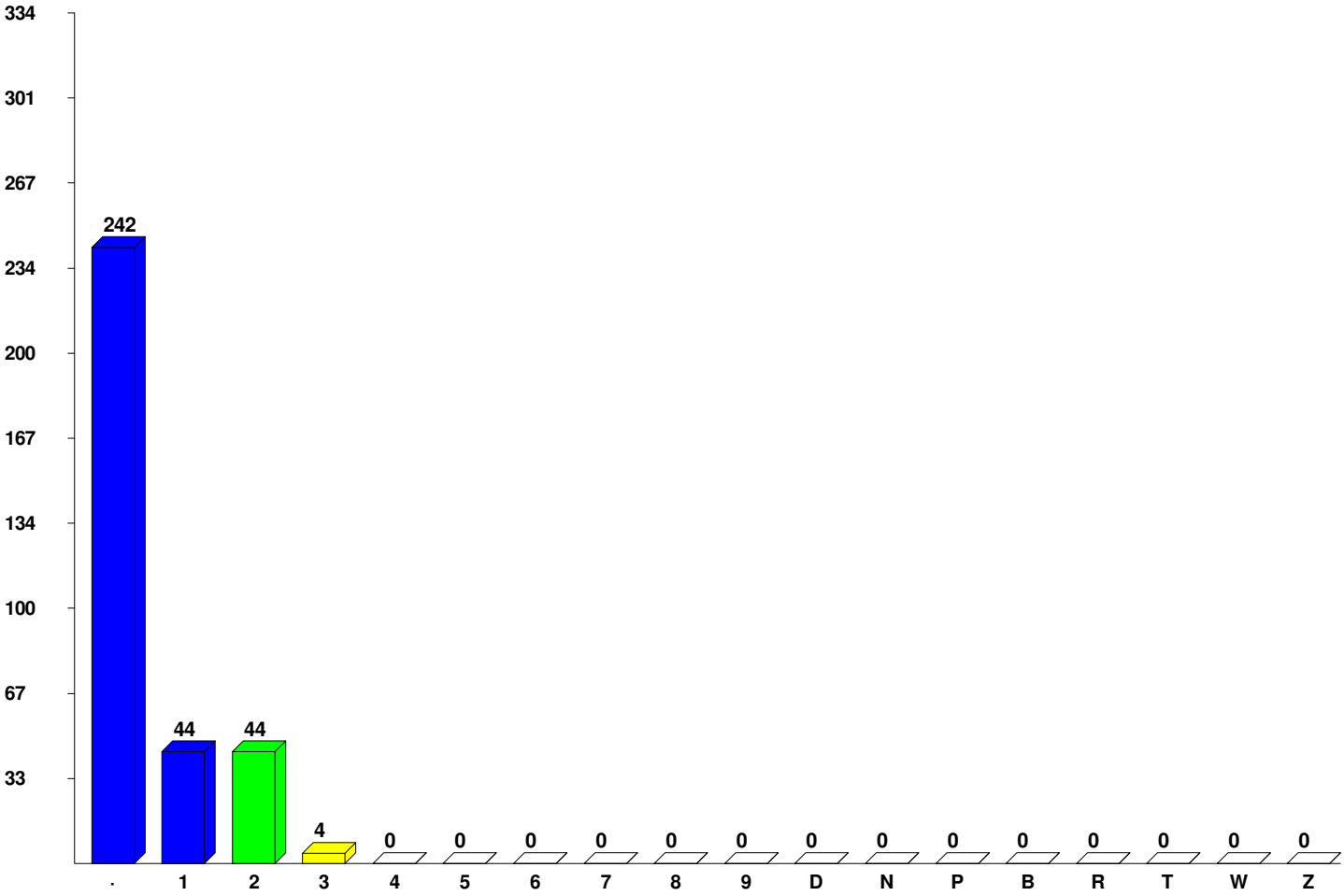
- R Provad UA (Plugg)
- T Var pluggad 2009
- W W
- Z Z
- Tube not to be inspected
- Tube to be inspected

kiwa

subject	: Boiler
page(s)	: 2 from 3
client	: Vejem Vaerne AS
site	: Vejen varnevaerk
order-no.	:
K.-No.	:
Date	: 2018-08-23
Material	: 1.4462 Duplex
length of leg	: 5400 mm
Ø External	: 60,30 mm
Ø Internal	54,76 mm
Wall thickness	: 2,77 mm

WinDevos Ver. 2.12.05 build 1412

Boiler - Part 2 - Statistic
final result - Part 2
(all tubes)



[1] : all tubes		**334**		
[2] : all tubes with indication		**92**	**27,5% from [1]**	
[3] : all inspected tubes		**334**	**100,0% from [1]**	
internal defects	**number**	**% [1]**	**% [2]**	**% [3]**
1 10 % - 19 %	44	13,2	47,8	13,2
2 20 % - 29 %	44	13,2	47,8	13,2
3 30 % - 39 %	4	1,2	4,3	1,2
4 40 % - 49 %	0	0,0	0,0	0,0
5 50 % - 59 %	0	0,0	0,0	0,0
6 60 % - 69 %	0	0,0	0,0	0,0
7 70 % - 79 %	0	0,0	0,0	0,0
8 80 % - 89 %	0	0,0	0,0	0,0
9 90 % - 100 %	0	0,0	0,0	0,0
external defects	**number**	**% [1]**	**% [2]**	**% [3]**
1 10 % - 19 %	0	0,0	0,0	0,0
2 20 % - 29 %	0	0,0	0,0	0,0
3 30 % - 39 %	0	0,0	0,0	0,0
4 40 % - 49 %	0	0,0	0,0	0,0
5 50 % - 59 %	0	0,0	0,0	0,0
6 60 % - 69 %	0	0,0	0,0	0,0
7 70 % - 79 %	0	0,0	0,0	0,0
8 80 % - 89 %	0	0,0	0,0	0,0
9 90 % - 100 %	0	0,0	0,0	0,0
	number	**% [1]**	**% [2]**	**% [3]**
· No defect	242	72,5		72,5
D Dent	0	0,0	0,0	0,0
N Not decideable	0	0,0	0,0	0,0
B Blocked	0	0,0	0,0	0,0
P Plug	0	0,0		
Tube not to be inspected	0	0,0		
Tube to be inspected	0	0,0		
R Provad UA (Plugg)	0	0,0	0,0	0,0
T Var pluggad 2009	0	0,0	0,0	0,0
W W	0	0,0	0,0	0,0
Z Z	0	0,0	0,0	0,0
V To be plugged	0	0,0		
X Extra to be plugged	0	0,0		

subject : Boiler
section : Part 2
client : Vejem Vaerne AS
site : Vejen varnevaerk
order-no. :
K.-No. :
Date : 2018-08-23
Material : 1.4462 Duplex
Tube length : 5400 mm
Ø External : 60,30 mm
Ø Internal 54,76 mm
Wall thickness : 2,77 mm
WinDevos Ver. 2.12.05 build 1412

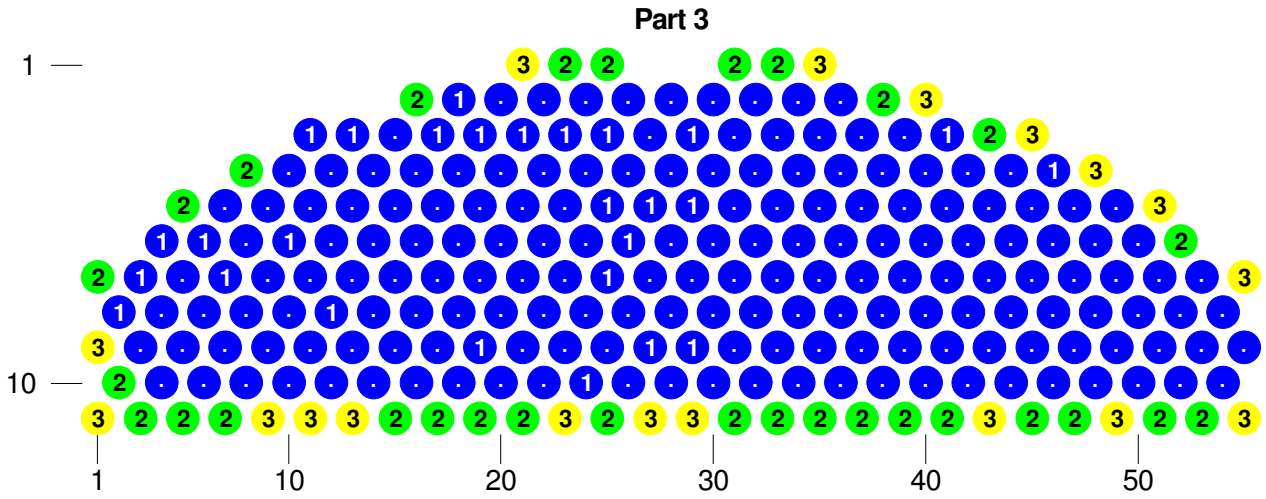
test parameter
Operator : PL / TL
equipment : TMT eddyMax
Probe type : Segmented RFT
Cal. Tube : Authentic Tube
Cal. Defect : AVH 0-80%

Plug criteria
internal defects From: 70%
external defects From: 70%

updated:
plugged tubes: 0 0,0%
available tubes: 334 100,0%

Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex

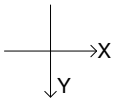
Boiler
Defect Picture
final result



internal defects		external defects	
1	10 % - 19 %	1	10 % - 19 %
2	20 % - 29 %	2	20 % - 29 %
3	30 % - 39 %	3	30 % - 39 %
4	40 % - 49 %	4	40 % - 49 %
5	50 % - 59 %	5	50 % - 59 %
6	60 % - 69 %	6	60 % - 69 %
7	70 % - 79 %	7	70 % - 79 %
8	80 % - 89 %	8	80 % - 89 %
9	90 % - 100 %	9	90 % - 100 %

- No defect
- D Dent
- N Not decideable
- P Plug
- B Blocked

view : Top
Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex

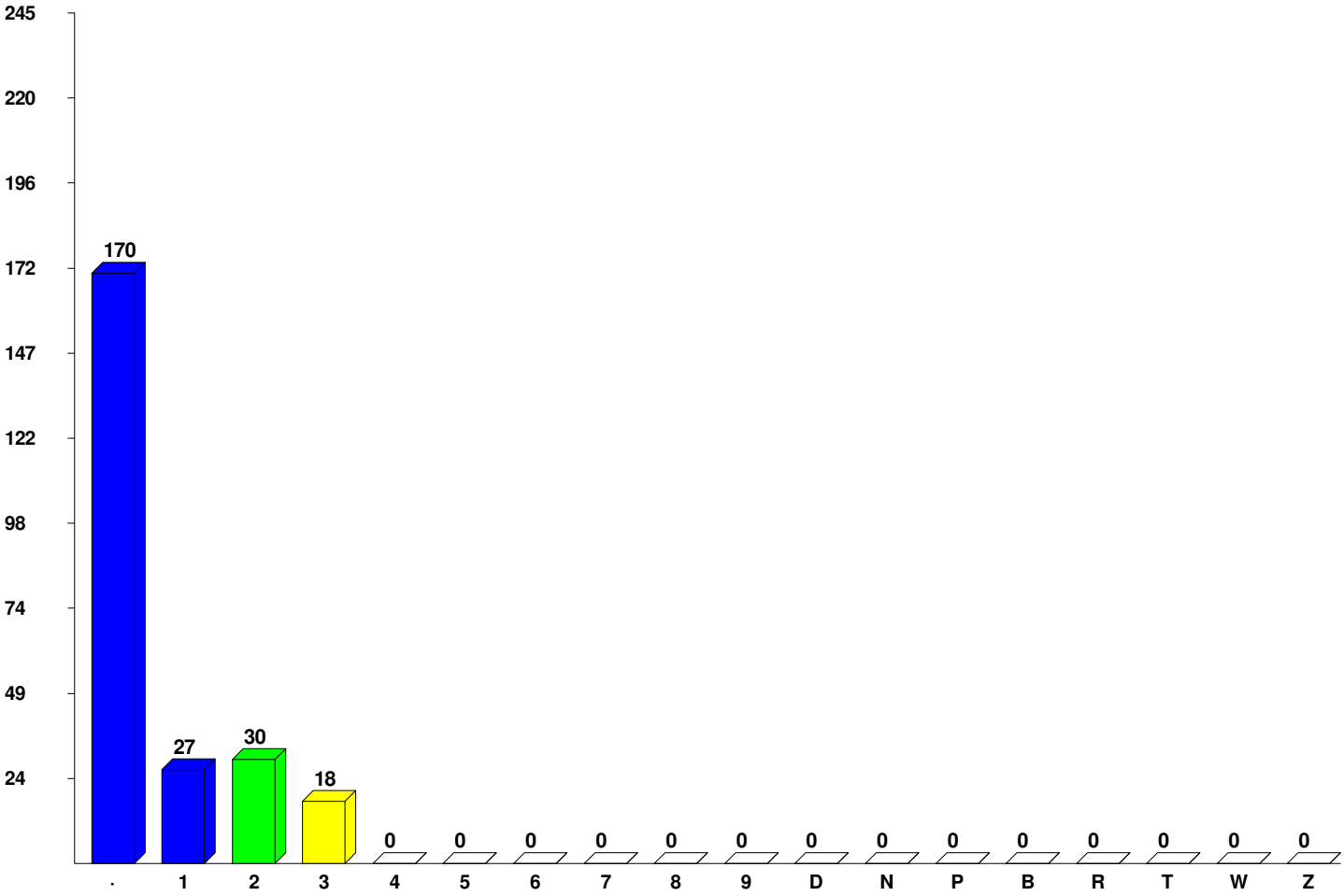


- R Provad UA (Plugg)
- T Var pluggad 2009
- W W
- Z Z
- Tube not to be inspected
- Tube to be inspected

subject	: Boiler
page(s)	: 3 from 3
client	: Vejem Vaerne AS
site	: Vejen varnevaerk
order-no.	:
K.-No.	:
Date	: 2018-08-23
Material	: 1.4462 Duplex
length of leg	: 5400 mm
Ø External	: 60,30 mm
Ø Internal	54,76 mm
Wall thickness	: 2,77 mm

WinDevos Ver. 2.12.05 build 1412

Boiler - Part 3 - Statistic
final result - Part 3
(all tubes)



[1] :	**all tubes**		**245**		
[2] :	**all tubes with indication**		**75**	**30,6% from [1]**	
[3] :	**all inspected tubes**		**245**	**100,0% from [1]**	
internal defects		**number**	**% [1]**	**% [2]**	**% [3]**
1	10 % - 19 %	27	11,0	36,0	11,0
2	20 % - 29 %	30	12,2	40,0	12,2
3	30 % - 39 %	18	7,3	24,0	7,3
4	40 % - 49 %	0	0,0	0,0	0,0
5	50 % - 59 %	0	0,0	0,0	0,0
6	60 % - 69 %	0	0,0	0,0	0,0
7	70 % - 79 %	0	0,0	0,0	0,0
8	80 % - 89 %	0	0,0	0,0	0,0
9	90 % - 100 %	0	0,0	0,0	0,0
external defects		**number**	**% [1]**	**% [2]**	**% [3]**
1	10 % - 19 %	0	0,0	0,0	0,0
2	20 % - 29 %	0	0,0	0,0	0,0
3	30 % - 39 %	0	0,0	0,0	0,0
4	40 % - 49 %	0	0,0	0,0	0,0
5	50 % - 59 %	0	0,0	0,0	0,0
6	60 % - 69 %	0	0,0	0,0	0,0
7	70 % - 79 %	0	0,0	0,0	0,0
8	80 % - 89 %	0	0,0	0,0	0,0
9	90 % - 100 %	0	0,0	0,0	0,0
		number	**% [1]**	**% [2]**	**% [3]**
·	No defect	170	69,4		69,4
D	Dent	0	0,0	0,0	0,0
N	Not decideable	0	0,0	0,0	0,0
B	Blocked	0	0,0	0,0	0,0
P	Plug	0	0,0		
	Tube not to be inspected	0	0,0		
	Tube to be inspected	0	0,0		
R	Provad UA (Plugg)	0	0,0	0,0	0,0
T	Var pluggad 2009	0	0,0	0,0	0,0
W	W	0	0,0	0,0	0,0
Z	Z	0	0,0	0,0	0,0
V	To be plugged	0	0,0		
X	Extra to be plugged	0	0,0		

subject : Boiler
section : Part 3
client : Vejem Vaerne AS
site : Vejen varnevaerk
order-no. :
K.-No. :
Date : 2018-08-23
Material : 1.4462 Duplex
Tube length : 5400 mm
Ø External : 60,30 mm
Ø Internal 54,76 mm
Wall thickness : 2,77 mm
WinDevos Ver. 2.12.05 build 1412

test parameter
Operator : PL / TL
equipment : TMT eddyMax
Probe type : Segmented RFT
Cal. Tube : Authentic Tube
Cal. Defect : AVH 0-80%

Plug criteria
internal defects From: 70%
external defects From: 70%

updated:
plugged tubes: 0 0,0%
available tubes: 245 100,0%

Part 1 = 88,9x3,2mm Carbon steel
Part 2 & 3 = 60,3x2,77mm Duplex