

Search query (20): [SP]: transformer winding work state detection method based on normalization singular spectrum entropies the invention discloses a transformer winding work state detection method based on normalization singular spectrum entropies. the method comprises the following steps: 1, performing frequency sweep excitation testing on transformer windings to obtain vibration frequency response curves of the transformer windings 2, performing curve fusion on the vibration frequency response curves of transformer windings of m test points to obtain a vibration frequency response fusion curve of the transformer windings 3, calculating the normalization singular spectrum entropies of the vibration frequency response fusion curves of the transformer windings and 4, according to the change of the normalization singular spectrum entropies of the vibration frequency response fusion curves, determining the states of the windings: when the change of the normalization singular spectrum entropies exceeds 10 percent, determining that the windings of transformers are changed, wherein at the moment, maintenance processing needs to be performed timely so that severe faults can be avoided. according to the invention, diagnosis of the states of the transformer windings can be realized, and the change condition of the transformer windings is efficiently and flexibly detected and at the same time, through fusion of the vibration frequency response curves of different test points, influences exerted by measuring errors on determining results are reduced to the minimum.

Results: 9

1) Family number: 65723033 (CN106682332A)

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Title: METHOD FOR NORMALIZATION OF TRANSFORMER WINDING VIBRATION ACCELERATIONS AT DIFFERENT TEMPERATURES

Priority: CN201611266560 20161231

Family:

Publication number	Publication date	Application number	Application date
CN106682332 A	20170517	CN201611266560	20161231

Probable Assignee: ELECTRIC POWER RES INST GUANGDONG POWER GRID CORP

Assignee(s):(std): ELECTRIC POWER RES INST GUANGDONG POWER GRID CORP

Assignee(s): ELECTRIC POWER RESEARCH INST GUANGDONG POWER GRID CORP ; GUANGDONG POWER GRID ELECTRIC POWER RESEARCH INST CO LTD

Inventor(s):(std): CAI SUN ; DENG XIAOWEN ; DU SHENGLEI ; GAO QINGSHUI ; JIN GE ; LIU SHI ; ZHANG CHU ; SUN WENXING ; YANG XIAN ; TIAN FENG ; YANG YI

International class (IPC 8-9): G06F17/50 (Advanced/Invention)

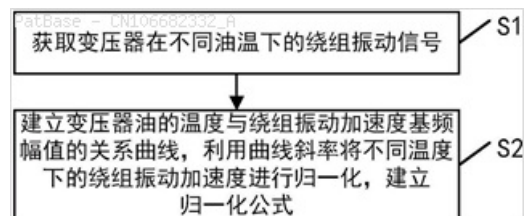
CPC: G06F17/5009

[Classification Explorer](#)

Cited documents: US2010191484 AA, CN106055888 A, CN105093059 A, CN104914327 A, CN104034289 A,

Abstract:

The invention provides a method for normalization of transformer winding vibration accelerations at different temperatures. Winding vibration signals of a transformer at different oil temperatures are obtained; a relation curve of the temperature of the transformer oil and winding vibration acceleration fundamental frequency amplitude is established, and a slope of curve is utilized to normalize the transformer winding vibration accelerations at the different temperatures. Through the normalization of the transformer winding vibration accelerations at the different temperatures, a power transformer fault diagnosis technology is improved, and manpower and material resources are improved.



2) Family number: 65660152 (US2018188291A)

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Title: METHOD AND SYSTEM FOR OSCILLOSCOPE TRIGGERING

Priority: CN201710001819 20170103 CN201710001820 20170103

Family:

Publication number	Publication date	Application number	Application date
CN106645856 A	20170510	CN201710001819	20170103
CN106645856 B	20190405	CN201710001819	20170103
CN106771456 A	20170531	CN201710001820	20170103
CN106771456 B	20190503	CN201710001820	20170103
US2018188291 AA	20180705	US20180859987	20180102

Probable Assignee: OF ELECTRONIC SCIENCE AND TECHNOLOGY OF CHINA UNIV

Assignee(s):(std): OF ELECTRONIC SCIENCE AND TECHNOLOGY UNIV ; UNIV ELECTRONIC SCI AND TECH CHINA ; UNIV ELECTRONIC SCIENCE AND TECH CHINA ; UNIV OF ELECTRONIC SCIENCE AND TECHNOLOGY OF CHINA

Assignee(s): OF ELECTRONIC SCIENCE AND TECHNOLOGY OF CHINA UNIV

Inventor(s):(std): TAN FENG ; ZENG HAO ; HUANG WUHUANG ; GUO LIANPING ; JIAO XIAOMAN ; ZHAO YONG ; SUN KAI ; JIANG JUN ; LIN XIANGXUAN ; QIU DUYU ; YANG KUOJUN

International class (IPC 8-9): G01R13/02 (Advanced/Invention)

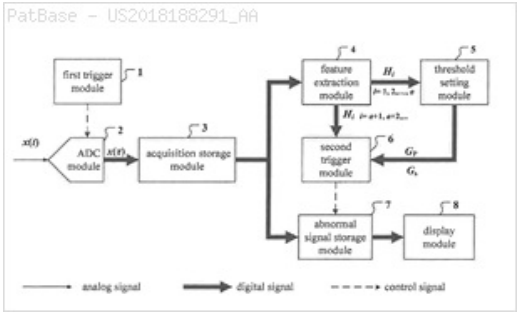
CPC: G01R13/0209 G01R13/0254

[Classification Explorer](#)

Cited documents: US2015370234 AA, US2009177423 AA, JP8054418 A2, CN105093059 A, CN104101751 A, CN103207296 A, CN101793955 A,

Abstract:

The present invention provides a method and system for oscilloscope triggering. The power spectrum entropy threshold G_p and the singular spectrum entropy threshold G_s are obtained by calculating the averages of the power spectrum entropy H_i and the singular spectrum entropy E_i of the first a waveform data frames respectively. Then, for the waveform data frame $x_{a+1}(t)$ and thereafter, If the power spectrum entropy H_i is greater than power spectrum entropy threshold G_p and the singular spectrum entropy E_i is greater than the singular spectrum entropy threshold G_s , the waveform data frame $x_i(t)$ is an abnormal signal, the second trigger occurs, storing and displaying the waveform data frame. Thus the storage and display of abnormal signal is realized



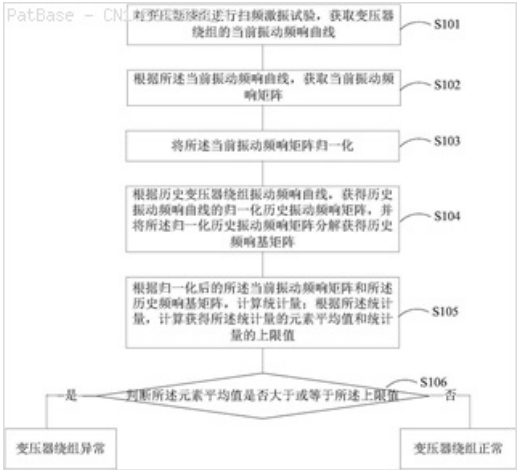
3) Family number: 62691178 (CN105699838A)

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Title:	A VOLTAGE TRANSFORMER WINDING STATE DETECTION METHOD AND AN APPARATUS THEREOF			
Priority:	CN201610058692 20160128			
Family:	Publication number	Publication date	Application number	Application date
	CN105699838 A	20160622	CN201610058692	20160128
	CN105699838 B	20180706	CN201610058692	20160128
Probable Assignee:	INST ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO LTD			
Assignee(s):(std):	INST ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO LTD ; INST OF ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO LTD ; OF ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO LTD INST ; SHANGHAI JIAO TONG UNIV ; UNIV SHANGHAI JIAOTONG			
Assignee(s):	OF ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO INST			
Inventor(s):(std):	QIAN GUOCHAO ; YU HONG ; PENG WENBANG			
International class (IPC 8-9):	G01M13/00 G01R31/02 G01R31/06 (Advanced/Invention)			
CPC:	G01R31/06 G01M13/00 G01R31/024			
Classification Explorer				
Cited documents:	US6466034 BA, US2014191774 AA, EP2466322 B1, CN105182116 A, CN105093059 A, CN104678223 A, CN103399255 A, CN103267907 A, CN103176104 A, CN102998545 A, CN101738567 A,			
Forward Citations:	CN108489717,			

Abstract:

The embodiment of the invention discloses a voltage transformer winding state detection method and an apparatus thereof. A present vibration frequency response curve of each measuring point can be accurately obtained through carrying out frequency sweep exciting tests on a voltage transformer winding, and converted into a mode of matrix; data of all the frequency points is taken into consideration so as to raise the precision of detection; and minimal deformation of the voltage transformer winding can be reflected in the present vibration frequency response curve, so that very high sensitivity is gained; normalization processing is further carried out on the vibration frequency response matrix to realize data nondimensionalization and raise the calculating efficiency; then a historical vibration frequency response matrix is decomposed into a non-negative matrix with a certain degree of sparseness; the proportion of basis vectors in overall data is raised, so that prominent features are represented by vectors of extremely few dimensions; and finally, through calculating a mean value and a control limit of statistics, whether abnormalities such as deformation occurs to the voltage transformer winding is determined quantitatively, thereby realizing extremely high precision.



4) Family number: 60929521 (CN105093059A)

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Title: TRANSFORMER WINDING WORK STATE DETECTION METHOD BASED ON NORMALIZATION SINGULAR SPECTRUM ENTROPIES

Priority: CN201510531014 20150826

Family:	Publication number	Publication date	Application number	Application date
	CN105093059 A	20151125	CN201510531014	20150826
	CN105093059 B	20181211	CN201510531014	20150826

Probable Assignee: ELECTRIC POWER RES INST OF YUNNAN POWER GRID CO LTD

Assignee(s):(std): ELECTRIC POWER RES INST OF YUNNAN POWER GRID CO LTD ; OF ELECTRIC POWER SCIENCES YUNNAN POWER GRID CO LTD INST ; SHANGHAI JIAO TONG UNIV ; UNIV SHANGHAI JIAOTONG

Assignee(s): ELECTRIC POWER RESEARCH INST OF YUNNAN POWERGRID CO

Inventor(s):(std): ZOU DEXU ; YU HONG ; JIN ZHIJIAN ; QIAN GUOCHAO ; WANG FENGHUA ; YAN BING ; WANG SHAOJING

International class (IPC 8-9): G01R31/06 (Advanced/Invention)

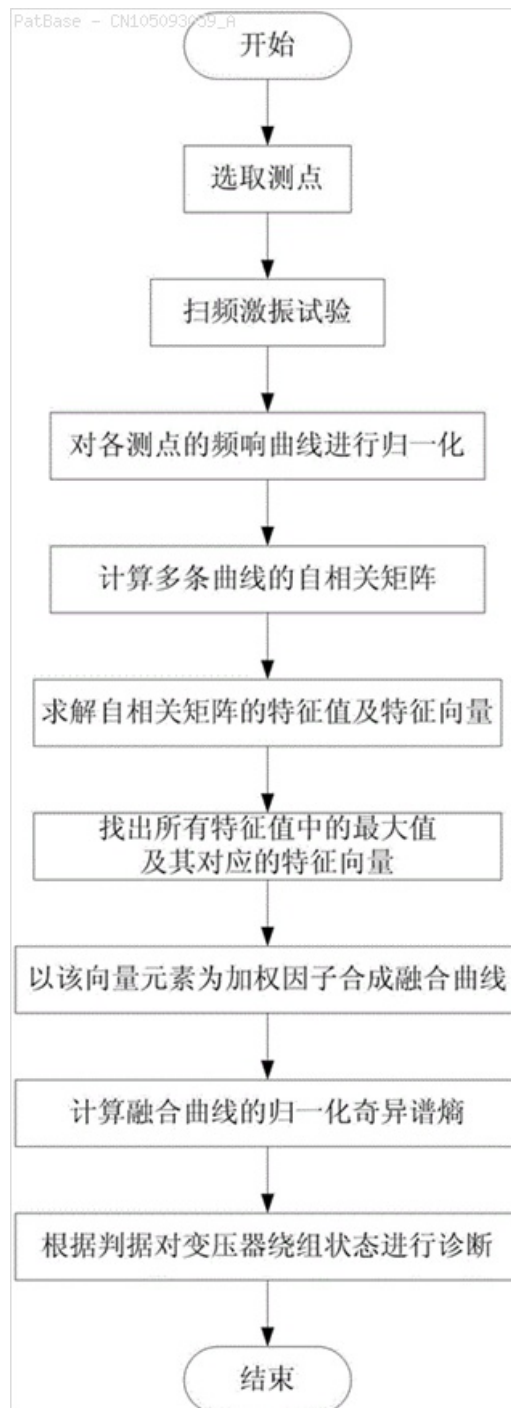
[Classification Explorer](#)

Cited documents: CN103163420 A, CN103116111 A, CN102998545 A, CN102721464 A, CN101833056 A,

Forward Citations: CN106682332, CN106645856, CN106645856, CN105699838,

Abstract:

The invention discloses a transformer winding work state detection method based on normalization singular spectrum entropies. The method comprises the following steps: 1, performing frequency sweep excitation testing on transformer windings to obtain vibration frequency response curves of the transformer windings; 2, performing curve fusion on the vibration frequency response curves of transformer windings of M test points to obtain a vibration frequency response fusion curve of the transformer windings; 3, calculating the normalization singular spectrum entropies of the vibration frequency response fusion curves of the transformer windings; and 4, according to the change of the normalization singular spectrum entropies of the vibration frequency response fusion curves, determining the states of the windings: when the change of the normalization singular spectrum entropies exceeds 10 percent, determining that the windings of transformers are changed, wherein at the moment, maintenance processing needs to be performed timely so that severe faults can be avoided. According to the invention, diagnosis of the states of the transformer windings can be realized, and the change condition of the transformer windings is efficiently and flexibly detected; and at the same time, through fusion of the vibration frequency response curves of different test points, influences exerted by measuring errors on determining results are reduced to the minimum.



5) Family number: 53864536 (CN103116111A)

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Title: METHOD FOR DIAGNOSING POWER TRANSFORMER WINDING WORKING CONDITION

Priority: CN201310021637 20130121

Family:	Publication number	Publication date	Application number	Application date
	CN103116111 A	20130522	CN201310021637	20130121
	CN103116111 B	20141224	CN201310021637	20130121

Probable Assignee: STATE GRID CORP CHINA

Assignee(s):(std): EAST CHINA ELECTRIC POWER TEST AND RESEARCH INST CO LTD ; SHANGHAI JIAO TONG UNIV ; SHANGHAI MUNICIPAL ELECTRIC POWER CO ; STATE GRID CORP OF CHINA ; STATE GRID CORP CHINA ; UNIV SHANGHAI JIAOTONG ; SHANGHAI MUNICIPAL ELEC POWER ; EAST CHINA ELECTRIC POWER RES INST CO LTD

Assignee(s): EAST CHINA ELECTRIC POWER RESEARCH INST CO ; STATE GRID OF CHINA CORP

Inventor(s):(std): WANG FENGHUA ; LIN YI ; HUANG HUA ; JIN ZHIJIAN ; GENG CHAO ; LI HONGLI

International class (IPC 8-9): G01R31/06 (Advanced/Invention)

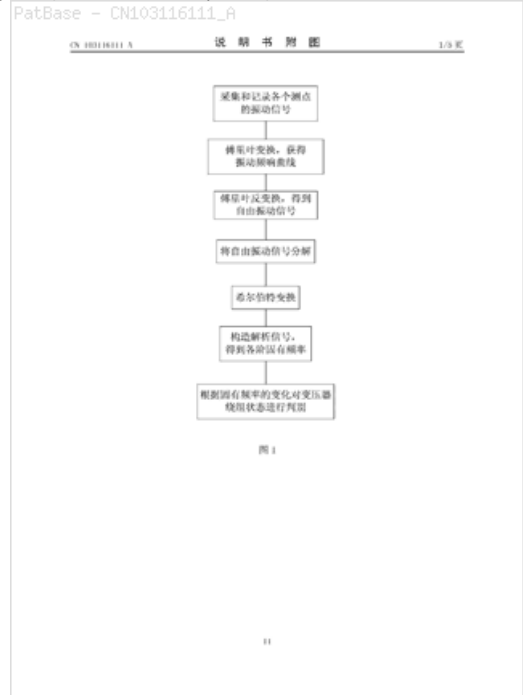
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Cited documents: US4897794 A, JP2000097982 A2, CN1776441 A, CN101937047 A, CN101738567 A, CN101556299 A,

Forward Citations: CN108917906, CN105627904, CN105627904, CN105352471, CN105203914, CN105093059, CN105093059, CN104345233, CN103454526, CN103454526, CN103454520, CN103176104,

Abstract:

The invention relates to a method for diagnosing power transformer winding working condition. The method includes the following steps: (1) inputting a signal V_i to a vibration generator to conduct vibration excitation to a power transformer winding, and collecting and recording a vibration signal V_{oi} of each measuring point according to N vibration acceleration sensors on the surface of the power transformer winding; (2), respectively conducting Fourier transform to the input signal V_i and the vibration signal V_{oi} of each measuring point, and then obtaining a vibration frequency response curve $H(\omega)$ of the power transformer winding; (3) conducting the Fourier transform to the vibration frequency response curve $H(\omega)$ and then obtaining a free vibration signal $H(t)$ of the power transformer winding; (4) decomposing the free vibration signal $H(t)$ into a plurality of natural mode functions; (5) conducting Hilbert transform to all natural mode functions which are obtained by decomposing; (6) constructing an analytic signal; (7) obtaining a k th natural frequency of the power transformer winding; (8) conducting discrimination to the power transformer winding working condition according to the changing of the natural frequency. Compared with the prior art, the method has the advantages of being precise in diagnosis, convenient to operate, safe and the like.



6) Family number: 46855725 (CN101833056A)

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Title: METHOD FOR DIAGNOSING DEFORMATION OF TRANSFORMER WINDING BASED ON FREQUENCY RESPONSE CHARACTERISTICS

Priority: CN201010134948 20100326

Family:	Publication number	Publication date	Application number	Application date
	CN101833056 A	20100915	CN201010134948	20100326
	CN101833056 B	20121003	CN201010134948	20100326

Probable Assignee: CHINA ELECTRIC POWER RES INST

Assignee(s):(std): CHINA ELECTRIC POWER RES INST ; CHINA ELECTRIC POWER RESEARCH INST

Assignee(s): CHINA ELECTRIC POWER RESEARCH INSTITUTE

Inventor(s):(std): YUAN XU ; JIANGANG BI ; YOUWEI LIU ; YANGUO DENG ; KELI GAO

Inventor(s): BI JIANGANG ; GAO KELI ; DENG YANGUO ; LIU YOUWEI ; XU YUAN

International class
(IPC 8-9): G01R31/06 (Advanced/Invention);
G01R31/02 (Core/Invention)

[Classification Explorer](#)

Cited documents: WO09069145 A2, WO0184168 A1, CN101344566 A,

Forward Citations: CN108917906, CN106526300, CN106526300, CN105180792, CN105180792, CN105093059, CN105093059, CN104154854, CN104154854, CN103529350, CN103529350, CN103328990, CN103267907, CN103267907, CN103176104, CN103135035, CN102788931, CN102788931,

Abstract:

The invention relates to a method for diagnosing deformation of a transformer winding based on frequency response characteristics. The method comprises the following steps of: (1) respectively acquiring a frequency response fingerprint of a winding to be diagnosed of a three-phase winding at the same voltage side of a transformer and an original frequency response fingerprint thereof; (2) judging characteristic points of the frequency response fingerprint of the winding to be diagnosed and the original frequency response fingerprint; (3) calculating amplitude difference factors of all characteristics on the original frequency response fingerprint; (4) calculating frequency difference factors of all characteristics points on the original frequency response fingerprint; (5) obtaining characteristic difference factors of the original frequency response fingerprint and the frequency response fingerprint of the winding to be diagnosed according to the amplitude difference factors and the frequency difference factors; and (6) judging whether the transformer winding generates deformation or not according to a characteristic difference factor judgment criterion. In the invention, whether the transformer winding generates the deformation or not is judged according to the characteristic points of the frequency response fingerprint of the transformer winding, therefore, whether the transformer winding generates the deformations or not can be accurately judged independent of experiences of professional staff. The invention can be not only applied to the analysis of frequency response fingerprint data, but also applied in the analysis of other similar data.

Priority: CN201210193231 20120613

Family:	Publication number	Publication date	Application number	Application date
	CN102721464 A	20121010	CN201210193231	20120613
	CN102721464 B	20131030	CN201210193231	20120613

Assignee(s):(std): JIANGSU ELECTRIC POWER CO ; NANJING POWER SUPPLY CO JIANGSU ELECTRIC POWER CO ;
NANJING POWER SUPPLY CO OF JIANGSU ELECTRIC POWER CO ; UNIV HOHAI ; NANJING POWER
SUPPLY COMPANY OF JIANGSU ELECTRIC POWER COMPANY ; STATE GRID CORP OF CHINA ; STATE
GRID CORP CHINA ; HOHAI UNIV

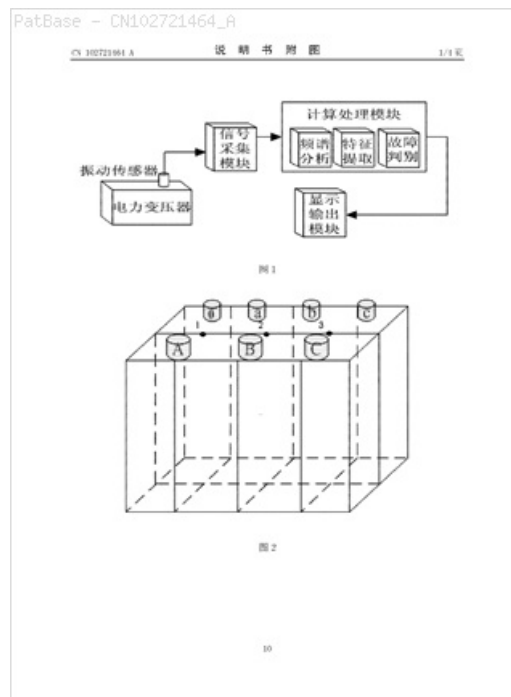
Inventor(s):(std): JINGMIN CHEN ; CHUNNING WANG ; HONGZHONG MA ; ZHIHUI GENG ; YONG LI ; KAI LI ; HONGFEI ZHAO ; KAI CHEN ; WANG CHUNNING ; CHEN KAI ; MA HONGZHONG ; LI YONG ; CHEN JINGMIN ; LI KAI ; GENG ZHIHUI ; ZHAO HONGFEI

Classification Explorer

Forward Citations:

CN107607157, CN107014484, CN106443257, CN106152980, CN106152980, CN105277274,
CN105093059, CN105093059, CN105092024, CN105092024, CN104833413, CN104748838,
CN104748838, CN104677489, CN104215203, CN104048748, CN103499382, CN103499382,
CN103454552, CN103454520, CN102997838, CN102997838.

The invention discloses a method for detecting winding deformation faults of a power transformer. The method includes that different vibration characteristics of the transformer in a normal state and a fault state are combined according to running characteristics of the transformer, vibration signals are monitored by a vibration sensor mounted on the surface of the transformer, frequency spectrums of the vibration signals are analyzed, and the transformer is judged to have winding deformation faults if the ratio of 50Hz energy sum and 150Hz energy sum to (50+150Hz) energy sum to (100+200Hz) energy sum which are actually measured is obvious increased as compared with that of the transformer in the normal state and an actually measured 100Hz energy value is hardly changed or even reduced as compared with that of the transformer in the normal state. The invention further discloses a system for detecting the winding deformation faults of the power transformer. The method and the system have the advantages of obvious fault characteristics and good repeatability, and are universal for power transformers of the same type, engineering implementation is simple, and diagnosis is intuitive.



8) Family number: 54161779 (CN103163420A)

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Title: INTELLIGENT POWER TRANSFORMER ON-LINE STATE JUDGMENT METHOD

Priority: CN201110403529 20111208

Family:

Publication number	Publication date	Application number	Application date
CN103163420 A	20130619	CN201110403529	20111208
CN103163420 B	20160120	CN201110403529	20111208

Probable Assignee: UNIV SHENYANG TECHNOLOGY

Assignee(s):(std): SHENYANG UNIV OF TECHNOLOGY ; UNIV SHENYANG TECHNOLOGY

Inventor(s):(std): LIN SHEN ; XU JIANYUAN ; ZHANG BIN

International class (IPC 8-9): G01R31/06 (Advanced/Invention)

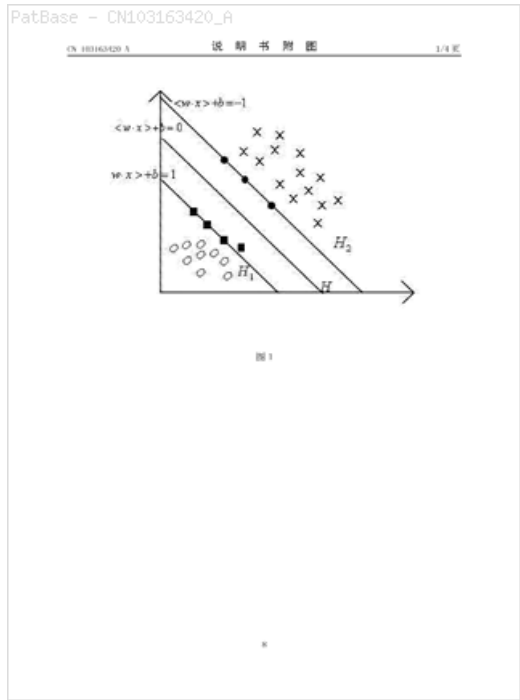
[Classification Explorer](#)

Cited documents: KR20110116841 A, KR20090079330 A, CN102156246 A, CN101782426 A,

Forward Citations: CN106468751, CN106124902, CN105988063, CN105988063, CN105699883, CN105699883, CN105469049, CN105467971, CN105467971, CN105425768, CN105425768, CN105093059, CN105093059, CN104678223, CN104360190, CN104360190, CN104267270, CN104267270, CN103778575, CN103645249, CN103645249,

Abstract:

Provided is an intelligent power transformer on-line state judgment method. Wavelet packet analysis is utilized for extracting energy spectrum entropy of power transformer vibration signals. A support vector machine is utilized for analyzing in a feature entropy form so that the judgment of a health degree over a winding deformation state inside the power transformer is put forward. The intelligent power transformer on-line state judgment method has the advantages that a judgment model is simple and a lot of state judgment samples are unnecessary; the operational state of a power transformer winding can be rapidly judged, and meanwhile, a level of the health degree is used for judging a damage grade of the power transformer winding state so that operational personnel can carry out a better prediction over an incipient failure of the power transformer. The intelligent power transformer on-line state judgment method has stronger flexibility and robustness, and can be widely used for the state evaluations, failure diagnosis and management decision of different kinds of power transformers. The intelligent power transformer on-line state judgment method has a wide application prospect.



9) Family number: 53342807 (CN102998545B)

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Title: ONLINE TRANSFORMER WINDING WORK STATE MONITORING METHOD

Priority: CN201110275583 20110916

Family:

Publication number	Publication date	Application number	Application date
CN102998545 A	20130327	CN201110275583	20110916
CN102998545 B	20150408	CN201110275583	20110916

Probable Assignee: HENAN ELECTRIC POWER RES INST

Assignee(s):(std): HENAN ELECTRIC POWER EXPERIMENTAL RESEARCH INST ; HENAN ELECTRIC POWER RES INST ; SHANGHAI JIAO TONG UNIV ; UNIV SHANGHAI JIAOTONG ; STATE GRID HE NAN ELECTRIC POWER RESEARCH INST

Assignee(s): HENAN ELECTRIC POWER RESEARCH INST

Inventor(s):(std): LI YUE ; LI QING ; CAI KAISUI ; JIN ZHIJIAN ; WANG FENGHUA

International class G01R31/00 G01R31/06 G06N3/08 (Advanced/Invention)

(IPC 8-9):

[Classification Explorer](#)

Cited documents: US2004164745 AA, JP2002305118 A2, CN101937047 A, CN101614775 A,

Forward Citations: WO16029629, CN106768262, CN106768262, CN106524896, CN106524896, CN105699838, CN105699838, CN105675962, CN105606045, CN105300585, CN105300585, CN105182172, CN105182172, CN105093059, CN105093059, CN104931128, CN104236702, CN104236702, CN103713217, CN103713217,

Abstract:

The invention discloses an online transformer winding work state monitoring method. The online transformer winding work state monitoring method includes steps of acquiring transformer box wall vibration signals, three-phase voltage signals of the transformer and three-phase current signals, correspondingly calculating three power factors according to the three-phase voltage signals and the three-phase current signals of the transformer; building a transformer box wall vibration model on the basis of generalized autoregression neural network; comparing amplitude of 100Hz component of the transformer box wall vibration signals with expected output quantity of the transformer box wall vibration model, judging that running state of a transformer winding is normal if the relative error is smaller than a threshold value; and judging that the transformer winding is loose or deformed when the relative error is larger than the threshold value. The online transformer winding work state monitoring method can effectively sensitively online monitor looseness and deformation of the transformer winding, and accordingly, the transformer can be overhauled or replaced in time, and fault of short circuit of the transformer resulting from the damage of the winding is avoided.

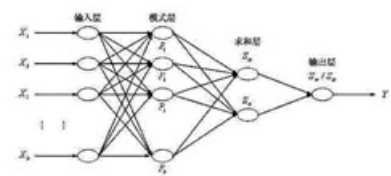


图 1

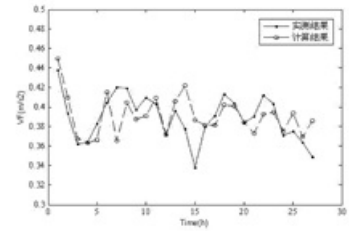


图 2