

(12) **United States Patent**  
Winkes

(10) **Patent No.:** US 9,410,551 B2  
(45) **Date of Patent:** Aug. 9, 2016

(54) **METHOD FOR OPERATING A COMPRESSOR**

F04D 27/0207; F04D 27/0223; F04D 27/0292;  
F05D 2270/46; F05D 2270/101  
See application file for complete search history.

(75) Inventor: **Georg Winkes**, Kaarst (DE)

(56) **References Cited**

(73) Assignee: **SIEMENS AKTIENGESELLSCHAFT**, München (DE)

U.S. PATENT DOCUMENTS

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 807 days.

2009/0274565 A1\* 11/2009 White ..... F04D 27/0215  
417/282  
2010/0152918 A1\* 6/2010 Riverin ..... F04D 27/02  
700/301

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **13/812,952**

CN 1671967 A 9/2005  
CN 1330229 C 8/2007  
DE 69728254 T2 3/2005  
DE 112004000695 T5 10/2006  
DE 102007035927 A1 2/2009

(22) PCT Filed: **Jul. 18, 2011**

(86) PCT No.: **PCT/EP2011/062248**

§ 371 (c)(1),  
(2), (4) Date: **Jan. 29, 2013**

(Continued)

*Primary Examiner* — Richard Edgar  
*Assistant Examiner* — Brian P Wolcott

(87) PCT Pub. No.: **WO2012/013530**

PCT Pub. Date: **Feb. 2, 2012**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2013/0129477 A1 May 23, 2013

A method for operating a compressor including providing suction pressure measurement, final pressure measurement, throughput measurement is provided. Using a first control characteristic map a target value for a pump surge limiter is determined from one or two of the measurements, and the pump surge limiter compares the target value to the throughput measurement, wherein the pump surge limiter opens a bypass valve when the measured value falls below or exceeds the target value, such that the final pressure is lowered or the flow through the compressor is increased. In the event of failure of a measurement, a further measurement of another physical variable of the compression process, together with a measured variable that did not fail or a modification of the measured variable, is an input variable for a substitute control characteristic map, from which a substitute target value is determined.

(30) **Foreign Application Priority Data**

Jul. 29, 2010 (DE) ..... 10 2010 032 652

(51) **Int. Cl.**

**F04D 27/00** (2006.01)  
**F04D 27/02** (2006.01)

(52) **U.S. Cl.**

CPC ..... **F04D 27/00** (2013.01); **F04D 27/0207** (2013.01); **F04D 27/0246** (2013.01); **F04D 27/0284** (2013.01)

(58) **Field of Classification Search**

CPC . F04D 27/02; F04D 27/0246; F04D 27/0284;

**5 Claims, 3 Drawing Sheets**

