



High Voltage Ceramic Capacitors: World Markets, Technologies & Opportunities: 2016-2021

Dennis M. Zogbi
CEO and Founder
Paumanok Publications, Inc.
502 Ballad Creek Court
Cary, NC 27519 USA
(919) 468-0384
(919) 468-0386 Fax
dennis@paumanokgroup.com
www.paumanokgroup.com

Published May 2016

©1988-2016 Paumanok Publications, Inc., includes the Industrial Market Research Division for Capacitors, Resistors, Inductors and Circuit Protection Devices; The Mergers & Acquisitions Due Diligence Division; The Single Client Consulting Division; The On-Site Presentation/Seminar and Events Division; The Monthly Report (MLCC, Chip Resistor and Tantalum Capacitor Supply Chain Monitoring); The Specialty Markets (Defense, Medical, Mining and Automotive Power); and 75% Ownership of Passive Component Industry Magazine.

82 Pages

\$2750.00 USD; ISBN # 1-893211-90-8 (HVCE2016)



©2016 Paumanok Publications, Inc. www.paumanokgroup.com



TABLE OF CONTENTS



.....	1
HIGH VOLTAGE CERAMIC CAPACITORS:	1
WORLD MARKETS, TECHNOLOGIES & OPPORTUNITIES: 2016-2021.....	1
TABLE OF CONTENTS	2
1.0 INTRODUCTION:	9
1.1 AN INTRODUCTION TO HIGH VOLTAGE CAPACITORS- 300 VOLTS AND ABOVE:.....	9
1.1 (B) <i>High Voltage Ceramic Capacitors:</i>	9
1.2 APPLICATION VOLTAGE CAPABILITY BY DIELECTRIC: A TECHNOLOGY COMPARISON: 2016	9
1.3 DEFINITIONS FOR HIGH VOLTAGE BY INDUSTRY: 2016	10
1.3.1 Automotive Definitions for High Voltage:	10
1.3.2 Industrial Definitions for High Voltage:	10
1.3.3 PC Board Definitions for High Voltage:.....	11
1.3.4 Power Utility Definitions for High Voltage:	11
2.0 TECHNOLOGY OVERVIEW:	11
2.2 HIGH VOLTAGE CERAMIC CAPACITORS: TECHNOLOGY OVERVIEW	11
2.2.1 <i>Ceramic Capacitor Configurations:</i>	11
2.2.1 (A) <i>Surface Mount Ceramic Chip Capacitors:</i>	11
2.2.1 (A1) <i>Multilayered Ceramic Capacitors (MLCC):</i>	12
2.2.1 (A2) <i>Axial and Radial Leaded MLC Ceramic Capacitors:</i>	12
2.2.1 (A3) <i>Single Layered Ceramic Capacitors:</i>	13



3.0 HIGH-VOLTAGE CAPACITORS: GLOBAL MARKET OUTLOOK: 2016-2021 16

3.2 High Voltage Capacitor Markets By Component Configuration (Small Cans, Large Cans, Throughhole and SMD Chips): 2016..... 16

3.2.1 The High Voltage, Small Can Capacitor Market: FY 2016..... 18

3.2.2 The High Voltage, Large Can Capacitor Market: FY 2016: 19

3.2.3 The High Voltage, Throughhole Capacitor Market: FY 2016:..... 19

3.2.4 The High Voltage MLCC Market: FY 2016: 19

3.4 Global Consumption Value For High Voltage Capacitors By Type, Dielectric and Configuration and Voltage Rating: 2016..... 19

3.4.1 High Voltage Capacitor Markets: 300 to 999 Volts: 21

3.4.2 High Voltage Capacitor Markets: 1 kV to 4.9 kV:..... 22

3.4.3 High Voltage Capacitor Markets: 5 kV to 9.9 kV:..... 22

3.4.4 High Voltage Capacitor Markets: 10 kV to 29.9 kV: 22

3.4.5 High Voltage Capacitor Markets: 30 kV to 800+ kV:..... 23

3.5 Global Consumption Value For High Voltage Capacitors By World Region: FY 2016 23

3.5.1 Recent Changes In The Regional Market for High Voltage Capacitors: FY 2016..... 24

3.5.2 Global Consumption Value for High Voltage Capacitors By Dielectric Type and World Region: FY2016: 25

3.5.2 (A) American High Voltage Capacitor Markets:..... 25

3.5.2 (B) European High Voltage Capacitor Markets:..... 25

3.5.2 (C) Asia-Pacific High Voltage Capacitor Markets:..... 25

3.6 High Voltage Capacitors: Demand By End-Use Market Segment: FY 2016..... 26

3.6.1 The High Voltage Power Supply and DC/DC Converter Capacitor Markets: FY 2016 28

3.6.1 (A) Key Customers for Capacitors In The High Voltage Power Supply Market: FY 2016 28

3.6.1 (B) Market Drivers For High Voltage Specialty Power Supplies: FY 2016 29

3.6.1 (C) Key End-Use Markets For Specialty High Voltage Power Supplies: FY 2016 31

3.6.2 The High Voltage Motor Drive and Inverter Capacitor Markets: FY 2016:..... 31

3.6.2 (A) Key Customers for Capacitors In The Industrial Motor Drive Market: FY 2016..... 32

3.6.2 (B) Growth Markets for High Voltage Capacitors in Renewable Energy System Inverters and DC Links: FY 2016 32

3.6.2 (C) Key Customers for Capacitors In The Inverter Market: FY 2016..... 32

3.6.3 The High Voltage Power Transmission and Distribution Capacitor Markets: FY 2016:..... 33

3.6.3 (A) The Turnkey Nature of The Utility Power Transmission and Distribution Market: FY 2016 33

3.6.3 (B) Key Customers for Capacitors In Utility Power Transmission and Distribution: FY 2016..... 34

3.6.4 The High Voltage Split Capacitor Motor Markets: FY 2016:..... 34

3.6.4 (A) Market Drivers for The High Voltage Split Capacitor Motor Markets: FY 2016..... 34

3.6.4 (B) Key Customers for Capacitors In The Split Capacitor Motor Market: FY 2016: 35

3.6.5 The High Voltage Defense Electronics Capacitor Markets: FY 2016: 36

3.6.5 (A) Impact of The US Sequester on The Defense Electronics Markets: FY 2016: 37

3.6.5 (B) Key Customers for High Voltage Capacitors In Defense Electronics: FY 2016: 37

3.6.6 The High Voltage Industrial PFC Capacitor Markets: FY 2016: 38



HIGH VOLTAGE CERAMIC CAPACITORS: WORLD MARKETS, TECHNOLOGIES & OPPORTUNITIES: 2016-2021

3.6.6 (A) Market Drivers For Industrial Power Factor Correction Capacitors: FY 2016:.....	39
3.6.6 (B) Key Customers for Industrial Power Factor Correction Capacitors: FY 2016:.....	39
3.6.7 The High Voltage Telecommunications Infrastructure Tip & Ring Capacitor Markets: FY 2016:.....	39
3.6.7 (A) Market Drivers For Tip & Ring Capacitors: FY 2016:.....	39
3.6.7 (B) Key Customers for Tip & Ring Capacitors: FY 2016	40
3.6.8 The High Voltage Medical Electronic Capacitor Markets (Test & Scan and Implantable Defibrillator): FY 2016:.....	41
3.6.8 (A) Medical Capacitors: High Voltage and High Q Combinations: FY 2016:	41
3.6.8 (A) Key Customers for High Voltage Capacitors in Medical Electronics: FY 2016:.....	41
3.6.9 The High Voltage Magnetic Ballast Capacitor Markets: FY 2016:.....	42
3.6.9 (A) High Voltage Ballast Market (Magnetic and HID Lighting Ballast Markets for Capacitors): FY 2016:.....	42
3.6.9 (B) Key Customers for High Voltage Capacitors in Lighting Ballasts: FY 2016:.....	43
3.6.10 The High Voltage Microwave Oven Capacitor Markets: FY 2016:	43
3.6.10 (A) Market Drivers For Microwave Oven Capacitors: FY 2016:.....	43
3.6.10 (B) Key Customers for High Voltage Microwave Oven Capacitors: FY 2016:.....	44
3.6.11 The High Voltage Oil & Gas Electronic Logging Tool and Downhole Pump Capacitor Markets: FY 2016:.....	45
3.6.11 (A) Market Drivers For High Voltage Capacitors Consumed in The Oil & Gas Electronics Industry: FY 2016:.....	45
3.6.11 (B) Key Customers for High Voltage Capacitors In The Oil & Gas Electronics Industries: FY 2016:.....	45
3.6.12 High Voltage Capacitors for Semiconductor Manufacturing: FY 2016	46
3.6.13 High Voltage Capacitors for Degaussing Circuits: FY 2016.....	46
3.6.13 (A) Changing Markets For AC & Pulse Capacitors Consumed In Degaussing Circuits: FY 2016:.....	46
3.7 High Voltage Capacitors: Demand By Capacitor Dielectric and End-Use Market Segment: FY 2016	47
.....	48
3.7.1 Market Synergies By High Voltage Capacitor Configuration; End-Use Market and Operating Voltage: FY 2016.....	48
3.8 Competitive Environment In High Voltage Capacitors: FY 2016	49
3.8.1 Global Sales & Market Shares for High Voltage Capacitor Vendors By Capacitor Type: FY 2016	51
3.8.3 Global Sales & Market Shares For High Voltage Ceramic Capacitors: FY 2016:	52
3.8.3 (A) Competitive Environment In High Voltage Ceramic Capacitors By Voltage Rating (0.5 to 5 kV; 5.1 to 10 kV; 11 kV to 100 kV): FY 2016	53
3.8.3 (B) Opportunity Analysis in High Voltage Ceramic Capacitors: 2015-2020.....	54
3.8.3 (C) Competitive Environment in High Voltage Ceramic Capacitors By Markets Served: FY 2016	55
3.9 Forecasts: 2021 Outlook For High Voltage Capacitors By Type:.....	56
3.9.6 The High Voltage MLCC Chip Capacitor Markets: FY 2016-FY 2021 Global Forecasts:.....	57
3.9.9 The High Voltage MLC Axial and Radial Capacitor Markets: FY 2016- FY 2021 Global Forecasts:.....	57
3.9.11 The High Voltage Single Layer Ceramic Capacitor Markets: FY 2016-FY 2021 Global Forecasts:	58
3.9.12 The High Voltage Ceramic Doorknob Capacitor Markets: FY 2016-FY 2021 Global Forecasts:.....	58
3.9.17 The High Voltage Glass Capacitor Markets: FY 2016-FY 2021 Global Forecasts:	58
3.10 Forecasts: 2021 Outlook For High Voltage Capacitors By Dielectric:.....	58
3.11 Forecasts: 2021 Outlook for High Voltage Capacitors By World Region:.....	60



HIGH VOLTAGE CERAMIC CAPACITORS: WORLD MARKETS, TECHNOLOGIES & OPPORTUNITIES: 2016-2021



3.12 Forecasts: 2021 Outlook For High Voltage Capacitors By End-Use Market Segment:	61
.....	61
DIRECTORY OF SUPPLIERS OF HIGH VOLTAGE CERAMIC CAPACITORS: 2016	62
AVX (HIGH VOLTAGE CERAMIC, PLASTIC FILM).....	62
AVX/KYOCERA CORPORATION (NYSE: AVX : RIC 6971:):.....	62
CALRAMIC TECHNOLOGIES LLC (PRIVATE).....	63
CKE (HIGH VOLTAGE CERAMIC).....	64
CKE (INCLUDES DEAN TECHNOLOGY, HV POWER ASSOCIATES AND HV POWER SOLUTIONS)	64
EUROFARAD (HIGH VOLTAGE CERAMIC & PLASTIC FILM).....	64
EUROFARAD (AN EXXELIA COMPANY).....	64
EXXELIA (HIGH VOLTAGE CERAMIC, PLASTIC FILM).....	65
EXXELIA GROUP	65
HIGH ENERGY (HIGH VOLTAGE CERAMIC, PLASTIC FILM)	66
HIGH ENERGY CORPORATION (INDUCTOTHERM)	66
HOLYSTONE (HIGH VOLTAGE CERAMIC)	67
HOLY STONE ENTERPRISE Co., LTD. (PUBLIC, TPE:3026)	67
JOHANSON (HIGH VOLTAGE CERAMIC)	67
JOHANSON DIELECTRICS (JOHANSON TECHNOLOGY, ADVANCED MONOLYTHIC CAPACITORS).....	67
KNOWLES (HIGH VOLTAGE CERAMIC, MANY OTHER DIELECTRICS)	68
KNOWLES CAPACITORS (PUBLIC, NYSE: KN) {NOVACAP, DLI AND SYFER}	68
MARUWA (HIGH VOLTAGE CERAMIC)	69
MARUWA CO., LTD. (PUBLIC, TYO:5344).....	69
MORGAN (HIGH VOLTAGE CERAMIC)	70
MORGAN TECHNICAL CERAMICS (ELECTROCERAMICS, RUABON DIVISION)	70
MURATA (HIGH VOLTAGE CERAMIC).....	71



HIGH VOLTAGE CERAMIC CAPACITORS: WORLD MARKETS, TECHNOLOGIES & OPPORTUNITIES: 2016-2021

MURATA MANUFACTURING COMPANY LIMITED (RIC: 6981):	71
NOVACAP (HIGH VOLTAGE CERAMIC)	72
NOVACAP (A DOVER COMPANY).....	72
PRESIDIO (HIGH VOLTAGE CERAMIC)	72
PRESIDIO COMPONENTS, INC. (PRIVATE).....	72
SPECTRUM CONTROL (HIGH VOLTAGE CERAMIC)	73
SPECTRUM ADVANCED SPECIALTY PRODUCTS GROUP	73
SRT-MC (HIGH VOLTAGE CERAMIC)	74
SRT MICRO-CERAMIQUE.....	74
SYFER (HIGH VOLTAGE CERAMIC)	74
SYFER TECHNOLOGY LIMITED (A KNOWLES SUBSIDIARY).....	74
TAIYO YUDEN (HIGH VOLTAGE CERAMIC).....	75
TAIYO YUDEN COMPANY LIMITED (RIC: 6976):.....	75
TEMEX (HIGH VOLTAGE CERAMIC)	76
TEMEX-CERAMICS (EXXELIA).....	76
TDK-EPC (HIGH VOLTAGE CERAMIC & PLASTIC FILM).....	77
TDK CORPORATION (RIC: 6762):	77
TRS (HIGH VOLTAGE CERAMIC).....	78
TRS TECHNOLOGIES, INC. (INCLUDES CENTRE CAPACITOR)	78
UNION TECHNOLOGY (HIGH VOLTAGE CERAMIC).....	78
UNION TECHNOLOGY CORPORATION	78
VISHAY (HIGH VOLTAGE CERAMIC & PLASTIC FILM).....	79
VISHAY INTERTECHNOLOGY (NYSE:VSH).....	79
WALSIN (HIGH VOLTAGE CERAMIC)	80
WALSIN TECHNOLOGY CORPORATION (2492):.....	80
<i>About Walsin:</i>	<i>80</i>



WRIGHT (HIGH VOLTAGE CERAMIC) 81
 WRIGHT CAPACITORS, INC. (PRIVATE) 81

ZONKAS (HIGH VOLTAGE CERAMIC) 81
 ZONKAS ELECTRONIC COMPANY LIMITED 81

TABLE OF FIGURES-

Figure 1: High Voltage Capacitor By Dielectric and Applicable Voltage Range: 2016 10

Figure 2: Capacitors By Type, Sub-Category and Maximum Voltage Rating: 2016 15

Figure 4: High Voltage Capacitors: Global Consumption Value By Component Configuration: 2016 18

Figure 6: Global High Voltage Capacitor Consumption Value By Dielectric and Voltage Rating: 2016 20

Figure 7: Global High Voltage Capacitor Consumption Value By Application Voltage: FY 2016 20

Figure 8: Global Consumption Value For High Voltage Capacitors By World Region: FY 2016 24

Figure 9: Global Consumption Value for High Voltage Capacitors By Dielectric Type and World Region: FY 2016 26

Figure 10: High Voltage Capacitor Consumption Value By End-Use Market Segment: FY 2016 27

Figure 11: Top Customers for Capacitors In Specialty Power Supplies: 4 Year Revenue Trend: 29

Figure 12: Power Supply Descriptions By End-Market: FY 2016 31

Figure 13: Top 13 Global Customers for Motor Run Capacitors: 2015 35

Figure 14: Top Capacitor Customers In Defense Electronics Equipment: 4 year Revenue Trend: 38

Figure 15: Top Capacitor Customers In The Telecommunications Infrastructure Equipment Market: 4 Year Revenue Trend 40

Figure 16: Top Capacitor Customers In Medical Test & Scan Equipment: 4 Year Revenue Trend: 42

Figure 17: Key Customers for High Voltage Microwave Oven Capacitors: 2015 44

Figure 18: Top Capacitor Customers In Oil & Gas Related Electronics Equipment: 4 Year Revenue Trend 45

Figure 19: Global Consumption Value for High Voltage Capacitors By Capacitor Type and End-Use Market Segment: FY 2016 48

Figure 20: Market Synergies By High Voltage Capacitor Configuration; End-Use Market and Operating Voltage: FY 2016 49

Figure 21: Global Market Shares In High Voltage Capacitors: 2016 50

Figure 22: Global Sales & Market Share Estimates for High Voltage Capacitors By Type: 2016 51

Figure 39: High Voltage CERAMIC Capacitor Vendors: FY 2016 Estimated Sales & Market Shares 52

Figure 40: Competitive Environment in High Voltage, Super High Voltage and Very High Voltage Ceramic Capacitors: FY 2016 ... 53



HIGH VOLTAGE CERAMIC CAPACITORS: WORLD MARKETS, TECHNOLOGIES & OPPORTUNITIES: 2016-2021



Figure 41: Competitive Environment in High Voltage Ceramic Capacitors by Markets Served: FY 2016 55

Figure 42: Forecasts: 2021 Outlook For High Voltage Capacitors By Type 56

Figure 43: Forecasts: 2021 Outlook For High Voltage Capacitors By Dielectric 60

Figure 44: 2021 Outlook For High Voltage Capacitors By World Region 60

Figure 45: Forecasts: 2021 Outlook For High Voltage Capacitors By End-Use Market Segment 61



1.0 Introduction:

1.1 An Introduction To High Voltage Capacitors- 300 Volts and Above:

This market research report covers the global market for high voltage capacitors. It is largely a “bundled” research report and includes key sections from other research reports conducted by Paumanok Publications, Inc. The reader should understand that within each dielectric, high voltage has a different definition. To summarize for the new reader, the overwhelming majority of capacitors consumed for high voltage applications are plastic film capacitors, and even then there is a focus on polypropylene film capacitor dielectrics only. These polypropylene capacitors are applicable to the hundreds of thousands of volts (up to about 800 kV) and are truly separate from other dielectrics in that respect. Ceramic capacitors, are also electrostatic, and can also be manufactured to withstand up to 100,000 volts. Aluminum electrolytic capacitors are also included in this report, and they are electrolytic in nature; but they cannot be manufactured for applications above 500 volts; however, their snap-in and screw terminal versions should be considered high voltage because they are consumed in many of the same industrial applications where we find high voltage electrostatic capacitors. Tantalum capacitors are excluded, because only a very small fraction of the tantalum capacitor market qualifies as a high voltage capacitor (i.e. those that are consumed in implantable defibrillators).

1.1 (B) High Voltage Ceramic Capacitors:

In the area of high voltage ceramic capacitors, we include only those capacitors 500 volts and above. This is a true representation of the high voltage ceramic capacitor markets and includes the high voltage multilayered ceramic capacitors, the high voltage single layer ceramic capacitors and the high voltage ceramic doorknob capacitors. High voltage ceramic capacitors are generally applicable from 500 volts to 100,000 volts.

1.2 Application Voltage Capability By Dielectric: A Technology Comparison: 2016

The following figure illustrates the application voltage of specific capacitors by dielectric type. The reader will note that plastic dielectric films have the broadest application voltage handling capability of any of the capacitor dielectrics, followed closely by ceramics. The remaining capacitor dielectrics represent small niche markets- high voltage mica, high voltage diamond, high voltage

