

Practical Power Magnetics Design Techniques

With
Basic Fundamentals

This Presentation will be a PowerPoint Projection.

The outline is on the following pages.

There are well over 800 slides.

October 29th & 30th, 2009

Colonel Wm. T. McLyman

Kg Magnetics, Inc.

<http://www.kgmagnetics.com>

colonel@kgmagnetics.com

Idyllwild, CA 92549-3703

Learn the Practical Fundamentals of Power Magnetics Design

Now my presentation is available on CD the entire lecture 45 segments over 800 pages in *pdf* format.

Colonel Wm. T. McLyman, Autobiography

Colonel McLyman has fifty-three years of experience in the field of Magnetics, and holds fourteen United States Patents on magnetics-related concepts. Through his thirty years at Jet Propulsion Laboratory (JPL) in power conversion and as the magnetic specialist, he has written over seventy JPL Technical Memorandums, New Technology Reports, and Tech-Briefs on the subject of magnetics and circuit designs for power conversion. He has worked on projects for NASA including the Pathfinder Mission to Mars, Voyager I and II, Topex/Poseidon, Cassini, Galileo, Magellan, Viking, International Solar Polar, Hubbell Space Telescope, Seasat, SIR-C, Mars Global Surveyor, NSCAT, and the Deep Space Network. Here is a list of a few of Colonel's patents:

5,103,163	Current transducer
4,975,672	High power/high frequency inductor
4,823,074	Low power consumption current transducer
4,656,412	Ferroresonant flux coupled battery charger
4,276,588	Push-pull converter with energy saving circuit for protecting switching transistors from peak power stress
4,245,288	Elimination of current spikes in buck power converters
4,039,925	Phase substitution of spare converter for a failed one of parallel phase staggered converters

He designed the Galileo signal rotary transformers used by the Command Data System (CDS), when the slip rings produced excessive noise on the 1-Mbit data bus. The performance of the signal rotary transformer exceeded all expectations. The rotary transformer on the Galileo Spacecraft lasted the life of the spacecraft, from 1989 to 2003 without a glitch.

He has designed the Quiet Converter with its low noise environment into programs such as WF/PC-II, Articulated Fold, Mirror Actuators, (Hubbell Space Telescope), MISR (Earth Orbiting System), Raman, and Mars 05 ONC, CCD Camera.

He is the author of four popular textbooks, Magnetic Core Selection for Transformers and Inductors, Transformer and Inductor Design Handbook, Designing Magnetic Components for High-Frequency DC-DC Converters, and the latest released book entitled, High Reliability Magnetic Devices: Design and Fabrication.

He has been on the lecture circuit for over twenty-five years speaking in the United States, Canada, Mexico, and Europe on the design and fabrication of magnetic components. He is known as a recognized authority in magnetic design. He has done many in-house seminars throughout the world. On the following pages is the outline of his two-day PowerPoint magnetic design course.

He is currently a consultant/contractor for SRS Technologies (JPL) in Montrose, CA, Babcock, Sanders Aeronautics, Inc. in Ione, CA., and Sandia National Laboratories in Albuquerque, New Mexico. He has recently finished an SBIR contract from NASA for the development of a high frequency power sine-wave rotary transformer converter for space and terrestrial exploration.

(Two Day Presentation)
Practical Power Magnetics Design Technique
With Basic Fundamentals

Presentation Outline

Section Titles	PowerPoint Slides
1. Contents Introduction and Symbols.....	15
2. Magnetic Fundamentals	21
3. Magnetic Materials	26
4. Dynamic B-H Loop	18
5. Permeability and the Air-Gap	15
6. Eddy Currents and Fringing Flux	17
7. Window Utilization	18
8. Magnet Wire and Foil	18
9. Regulation	08
10. Apparent Power, Pt	10
11. Power Magnetic Design Fundamentals	29
12. Magnetic Cores Configuration	36
13. Minimizing Leakage Inductance	14
14. Minimizing Winding Capacitance	10
15. Transformer Converter Magnetics	19
16. Flyback Converter Magnetics	32
17. Forward Converter Magnetics	09
18. Current Transformer Design	25
19. Skin and Proximity Effect	25
20. Flyback Converter Design (discontinuous current)	30
21. Forward Converter Transformer Design	24
22. Input Filter Design	23
23. Common Mode Inductor Design Considerations	20
24. Designing Ultra Small Inductor	13
25. Single Coil Magnetic Amplifier Design	20
26. Transformer Cooling	16
27. Designing Coupled Output Inductors	12
28. Test and Evaluation	23
29. Design Aids	13
30. High Voltage Design Guidelines Overview	60
31. Tapped Inductor	13
32. Composite and Modified Cores Design	11
33. Designing Volt-Second Devices	15
34. Design Boost Converters for Power Factor Corrections (PFC)	25
35. Rotary Transformer	31
36. Area Product, Ap Derivation for Transformer	07
37. Area Product, Ap Derivation for Inductor	08
38. Core Geometry, Kg Derivation for Inductor	11
39. Core Geometry, Kg Derivation for Transformer	11
40. Saturable Reactor	31
41. Gapped AC Inductor	18

Design Exercises

The design exercises will be a complete design. The attendee is given a specification for each of the following exercises. The attendee will then do the design exercises. These exercises will include picking the correct core, calculating the number of turns, calculating the temperature rise and wire size to meet the specifications.

Class Design Exercise	
80. Design Exercise #1 Powder Core Inductor	16
81. Design Exercise #1 Powder Core Inductor Work Sheets	16
82. Design Exercise #2 Gapped Inductor	18
83. Design Exercise #2 Gapped Inductor Work Sheets	18
84. Design Exercise #3 HF Push-Pull Transformer	20
85. Design Exercise #3 HF Push-Pull Transformer Work Sheets	20
86. Design Exercise #4 Line Isolation Transformer Design	15
87. Design Exercise #4 Line Isolation Transformer Design Work Sheets	15

Colonel Wm. T. McLyman
Kg Magnetics, Inc.
P.O. Box 3703
26504 Crestview Drive
Idyllwild, CA 92549-3703
Website: www.kgmagnetics.com
Email: colonel@kgmagnetics.com