Prototype Powertrain in Motorsport Endurance Racing
Other SAE International Books of Interest:

Kinetic Energy Recovery Systems for Racing Cars
By Alberto Boretti
(PRODUCT CODE: PT-159)

Engine Design Concepts for World Championship Grand Prix Motorcycles
By Alberto Boretti
(PRODUCT CODE: PT-155)

Design of Racing and High-Performance Engines 2004-2013
By Douglas Fehan
(PRODUCT CODE: PT-157)
Prototype Powertrain in Motorsport Endurance Racing

ALBERTO BORETTI

Warrendale, Pennsylvania, USA
Introduction vii

CHAPTER 1
World Sportscar Championship: 1953 to 1992 1

CHAPTER 2
24 Hours of Le Mans and Le Mans Racing Series: 1993 to 2011 11

CHAPTER 3
World Endurance Championship: 2012 to Present 15

CHAPTER 4
The Future of Le Mans Prototypes 25

PAPER 1
Mark II - 427 GT Engine Induction System 31
http://papers.sae.org/670067/

PAPER 2
Mazda 4-Rotor Rotary Engine for the Le Mans 24-Hour Endurance Race 51
http://papers.sae.org/920309/

PAPER 3
The Direct Injection System of the 2001 Audi Turbo V8 Le Mans Engines 63
http://papers.sae.org/2002-01-3537/

PAPER 4
KERS Braking for 2014 F1 Cars 77
http://papers.sae.org/2012-01-1802/
PAPER 5

Toyota Motorsports Pursues Le Mans Prize with 1000-PS All-Wheel-Drive Hybrid

http://articles.sae.org/13020/

PAPER 6

Performance of Ancillary Systems of 2014+ Le Mans LMP1-H Vehicles and Optimization

http://papers.sae.org/2015-01-1163/

PAPER 7

Automakers vie for Le Mans with Different Solutions

http://articles.sae.org/14236/

PAPER 8

Nissan Debuts Front-Engine, Front-Drive GT-R LM Nismo Racecar

http://articles.sae.org/13913/

PAPER 9

Regenerative Braking of a 2015 LMP1-H Racing Car

http://papers.sae.org/2015-01-2659/

PAPER 10

E-KERS Energy Management Crucial to Improved Fuel Economy

http://papers.sae.org/2016-01-1947/

References
Introduction

_The most important victory is the one which has to arrive._

—Enzo Ferrari

Motor sport is still the prime motivation for automotive engineering studies, with Ferrari still the most successful brand of every product conceived so far. The World Sportscar Championship (WSC) was for many years the most relevant motorsport competition, surpassing F1, NASCAR, and Indy. The championship evolved, from a small number of road events in Europe and North America with gentlemen drivers, to a professional racing series featuring the world’s largest automakers. It may become the avenue for achieving dramatic fuel efficiency improvements in passenger cars while also providing high technical and sporting interest. The aim of this book is to present the latest developments in hybrid powertrains for World Endurance Championship (WEC) prototypes. The sporting competition provides a summary of the 60-year history of the WSC, Le Mans racing and Le Mans racing series. The book is intended for motor enthusiasts, mechanical and automotive engineering students, and automotive industry engineers; from technical staff to executives. Hybrid powertrains are a major area of concern for automotive Research & Development (R&D). Racing innovation must be relevant to production cars. Ideas under development for Le Mans racing prototypes may be beneficial to passenger cars, with relevance strengthened through better regulations for the sporting event. Through a proper introduction and carefully selected SAE papers, readers will appreciate motorsport in general and the WSC specifically.