

# **TOOLS, FASTENERS, TORQUEING, SHOP SAFETY**

## **TECHNICAL KNOWLEDGE.....5**

*The Most Critical Tool of All*

Knowledge of Motorcycle Systems  
Systematic Troubleshooting Procedures

## **SERVICE MANUALS.....5**

## **DIAGNOSTIC TESTING TOOLS.....7**

Digital Volt-Ohmmeters  
Conductance Battery Testers  
Current Clamps - Fluke i410 AC/DC  
Ignition Testers  
Ignition Tester – IgnitionMate  
Battery Chargers  
Continuity Testers  
Circuit Testers  
Cylinder Compression Gauge  
Cylinder Leak-down Tester

## **FASTENERS.....19**

*Bolt, Screw and Torque Specifications*

U.S. Customary and Metric  
Bolt Head Sizes  
Right Hand and Left Hand Threads  
Bolt Diameter, Pitch, Width and Flats  
Bolt Terminology  
Bolt Grades and Strength Marks  
Torx Bolts  
Deep Recess Bolts  
Miscellaneous Fasteners and Washers  
Bolt Torque Specifications  
Torqueing With Extensions

Torque To Yield Bolts  
High-Torque Fastener Requirements  
Torqueing Procedure  
Threadlocking Adhesives – Types and Uses

<b>PRECISION MEASURING TOOLS.....</b>	<b>38</b>
<b>WRENCHES AND RATCHETING WRENCHES.....</b>	<b>42</b>
<b>HEX BITS, HEX WRENCHES and HEX T-HANDLE.....</b>	<b>44</b>
<b>SOCKETS and SOCKET DRIVERS.....</b>	<b>46</b>
<b>RATCHETS, SPEED HANDLES, T-HANDLES, BREAKER BARS.....</b>	<b>47</b>
<b>EXTENSIONS AND UNIVERSALS.....</b>	<b>48</b>
<b>EFFICIENT AND SAFE USE OF RATCHETS AND SOCKETS.....</b>	<b>49</b>
<b>AIR AND CORDLESS IMPACT WRENCHES.....</b>	<b>49</b>
<b>TYPES OF PLIERS.....</b>	<b>50</b>
<b>HAMMERS.....</b>	<b>50</b>
<b>THREAD REPAIR AND EXTRACTION TOOLS.....</b>	<b>51</b>
<b>ELECTRICAL AND WIRING TOOLS.....</b>	<b>52</b>
<b>MISCELLANEOUS TOOL LIST.....</b>	<b>53</b>
<b>CONSUMABLES.....</b>	<b>53</b>
<b>SHOP SETUP.....</b>	<b>54</b>
<b>DYNOMOMETERS.....</b>	<b>59</b>
<b>SHOP SAFETY GUIDELINES.....</b>	<b>59</b>
<b>TEST QUESTIONS AND ANSWERS.....</b>	<b>61</b>

## **TECHNICAL KNOWLEDGE**

*The most critical tool of all*

### **Knowledge of Motorcycle Systems**

Wrenches and socket sets are of little value if a mechanic has little or no knowledge of motorcycle systems. The chapters in this course provide this knowledge.

For example, a thorough understanding of electrical theory, the battery, charging systems, and starting systems will equip a technician with a solid foundation of understanding the electrical issues that are involved in many common problems.

### **Systematic Troubleshooting Procedures**

Systematic problem solving procedures are tools that enable a mechanic to verify problems, eliminate unlikely causes, find the most likely cause, and repair the problem. It is not “rocket science”. In fact, the implementation of computerized fuel injection and ignition systems has relieved mechanics of many of the headaches that carburetors and mechanical ignitions used to bring.

In addition, plenty of mechanic activities involve maintenance. Mechanics do not have to tear engines down and do overhauls on a constant basis.

In some ways, motorcycles are much simpler to work on than cars. Just look at the enormous toolboxes used by the average automotive mechanic. Their tool requirements are seemingly endless – not to mention the monetary expenditures of having to buy new tools to keep up with technological changes.

## **SERVICE MANUALS**

Service manuals contain invaluable specific information about the motorcycle parts and systems of specific brands and models of motorcycles.

The service manual is the original “go to” tool in the mechanics’ toolbox. The manual contains the specifications for just about every single part and system on a particular motorcycle.

These specifications involve precision measurements of parts and service wear limits. In other words, how much wear is acceptable on a part before it must either be reconditioned or replaced?

The service manual instructs the mechanic in specific disassembly and assembly procedures. Critical torque specifications are also included for virtually every part.

The detailed diagrams of the parts in individual components allow the mechanic to instantly visualize the part or system in its’ entirety. Diagrams are an instant “window” to look through - a detailed snapshot of components and systems.

**The only issue with service manuals is that they are not typically a good “teaching resource”. The knowledge of motorcycle systems and systematic troubleshooting must be acquired by the mechanic from courses and studies.**

The service manual can sometimes refer to tools and procedures that the mechanic will not immediately understand, and the service manual will not explain them well. Specific courses in engine building, motorcycle systems, troubleshooting and maintenance procedures are necessary to “fill in the blanks”.

**Service manuals often tell you “what to do”. However, they often do not tell you in enough detail “how to do it”. There is a huge difference in these two concepts. The mechanic must have some training outside of the technical information in the service manual.**

**If technical information and instructions are poorly explained in textbooks and service manuals, it makes the mechanics job more difficult. The chapters in this course seek to reverse this common problem with detailed, well-explained, and well-organized information.**

