# Fletcher

Product Newsletter

**J. H. Fletcher & Co.** HUNTINGTON, WEST VIRGINIA

Volume 2, Issue 4 December, 1990


# COUNTERFEITERS: CHEATING MAINTENANCE WITH BAD BOLTS

By **RICH CROSS**
Senior Technical Editor,
*COMMERCIAL CARRIER JOURNAL*

About a year ago, Gelco Truck Leasing's In-Service Center, Ft. Wayne, Ind., was alarmed by a rash of broken and necked-out 5th wheel mounting bolts. According to Gelco's district manager Don Holms, the aftermarket mounting bolts were discovered to be counterfeits - imported bolts far weaker than their SAE Grade 8 head marks (i.e., six radial lines) indicated.

Since 5th wheels and substandard mounting bolts can be a deadly combination, Gelco decided to standardize on Grade 8 Huck-Fit fasteners from Huck Manufacturing Co.'s Industrial Fastener Div., Waco, Tex.

Installed with a special power tool that ensures proper torque, the Huck fasteners have eliminated 5th wheel bolt failures, Holms told CCJ.

Another example of failed counterfeit bolts is provided by Bill Larson, quality assurance inspector at the Metropolitan Transit Authority bus fleet of Harris County, Tex.

After reading an account of the hazards posed by counterfeit SAE-grade fasteners, "We wasted no time in surveying our mechanics about the frequency of bolt-related failures," Larson says.

"We discovered, for example, that many flywheel bolts and aftermarket head bolts were breaking before our mechanics could apply the proper amount of torque," he says. "Worse than that, we determined that bolt breakage was responsible for numerous road failures and come-back repairs.

"Our solution was to identify and toss out the counterfeits, buy head bolts exclusively from Detroit Diesel and stock our bins with nuts, bolts and washers from Bowman Distribution, Cleveland, Oh. Since that time, bolt-related problems have virtually disappeared."

Larson claims that fleetmen who purchase bolts on a low-bid basis from a variety of sources are asking for trouble. In fact, based on Larson's experience, it takes only one delivery of substandard bolts to nickel-and-dime a maintenance budget to death...in some cases, before anyone knows what's happening.

If a distributor stocks a fleet's bins with a mixed bag of bolts from several countries, and some of the bolts are substandard, failures will be sporadic rather than epidemic. As a result, maintenance managers may attribute bolt failures to over-torquing, and never consider that substandard bolts are to blame.

Instead, Larson advises, fleetmen should ask mechanics to retain the heads of failed bolts and/or record the maker's I.D. marks. Armed with that information, a carrier can purge its bins of substandard bolts and avoid purchasing them in the future.

**Threat One: Bad bolts**

Genuine SAE grade steel bolts comply fully with Society of Automotive Engineers Standard J-429, *Mechanical and Material Requirements for Externally Threaded Fasteners*.

SAE's mechanical requirements include: hardness; proof load (the amount of stress endured without permanent elongation); and tensile strength (the amount of stress endured without breakage).

SAE material requirements specify the type of steel which must be used. "Martinsite" refers to steel that has been hardened by rapid cooling.

The basic specs for selected SAE grades are:

- Grade 5: 85,000 psi proof load, 120,000 psi tensile strength, Medium-carbon steel
- Grade 5.2: 85,000 psi proof load, 120,000 psi tensile strength, Low-carbon martinsite steel
- Grade 8: 120,000 psi proof load, 150,000 psi tensile strength, Medium-carbon alloy steel
- Grade 8.2: 120,000 psi proof load, 150,000 psi tensile strength, Low-carbon martinsite steel

Genuine Grade 8 bolts are the most expensive because they are made of premium-priced alloy steel. Grade 5s are the second most costly because they are made of medium-carbon steel.

In contrast, counterfeit versions of those bolts are made of low-carbon martinsite steel - a relatively inexpensive and easily-processed metal used in Grade 8.2 and Grade 5.2 bolts. Low-carbon bolts aren't inherently weak, but they tend to stretch and loosen when used in high-heat environments such as an engine or exhaust system.

Bolts most likely to fail, however, are counterfeits made of inferior steel and/or improperly heat treated, according to U.S. government investigators.

Alarmed by the fact that substandard counterfeit bolts were discovered in military vehicles and weapons, commercial airliners, interstate highway bridges, NASA's Titan missiles and space shuttles, and nuclear power plants, Congressman John Dingell (D-Mich.), chairman of the House subcommittee on Oversight and Investigation of the Committee on Energy and Commerce, held hearings on counterfeit bolts last year.

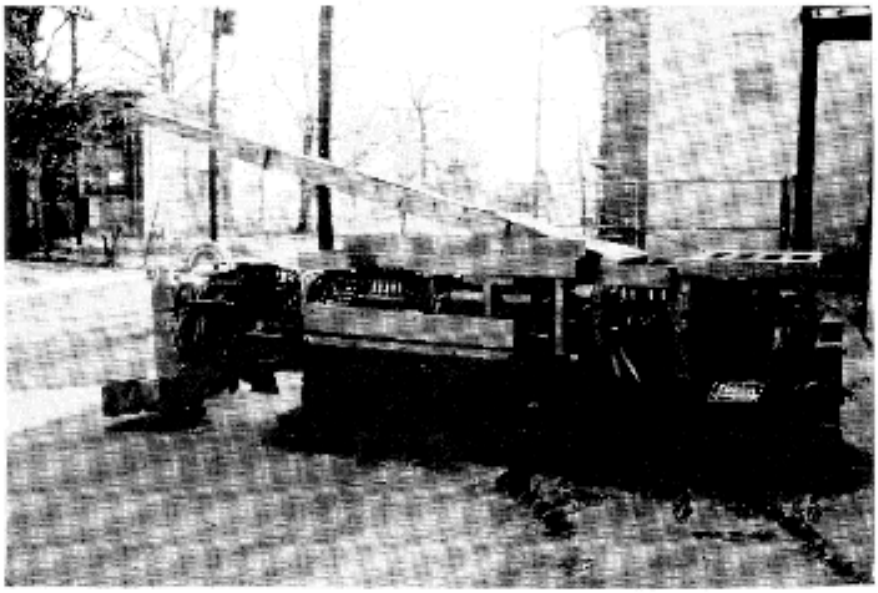
# LONGWALL ROOF BOLTER

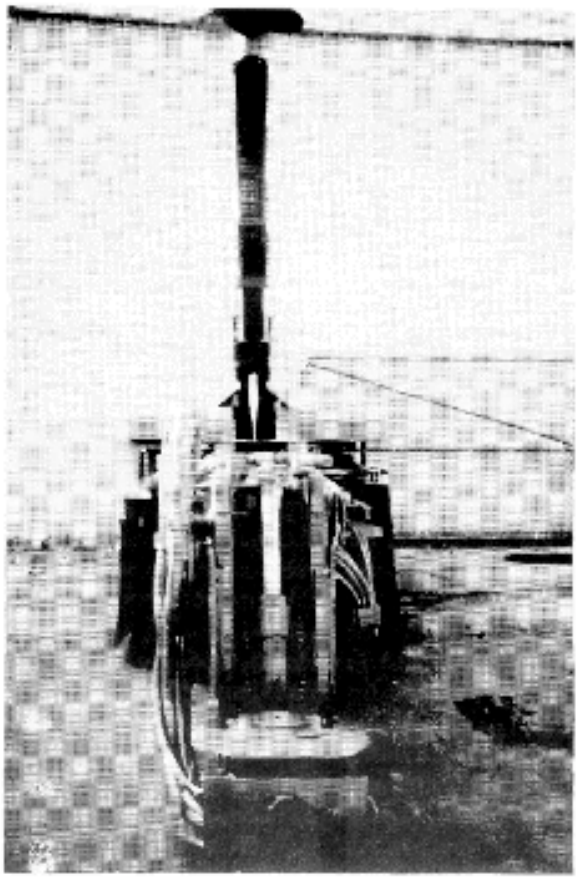
Our Model DR roof drill is a narrow, compact machine designed for longwall applications and utility bolting. Two basic arrangements are available. The first layouts utilize a manually controlled tram system with or without cable reel. The other arrangements are based upon a pendant type remote controlled tram system.

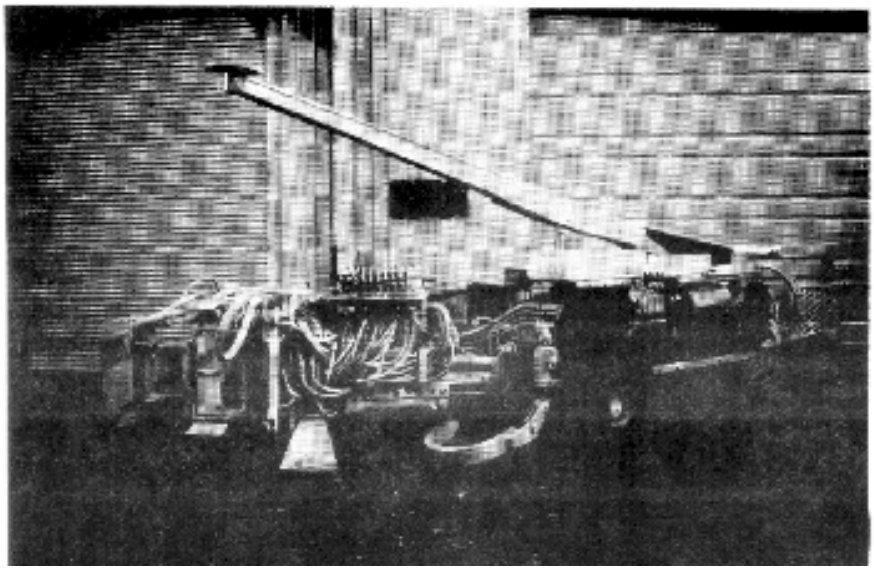
All DR drills are equipped with a versatile boom with swing, extend, pivot and tilt capability. An optional boom lift feature which is useful in severe tramming conditions can be provided.

In the longwall application, this drill uses a single arm type ATRS system. In utility applications an optional turkey foot ATRS must be installed.

Like all Fletcher machines, the DR drill can be customized to meet your mining conditions and applications. For further information, please contact Bill Ellis or Bob Stach in our Sales Department.







Responding to Dingell's request, Raymond Krammer, deputy director, National Bureau of Standards, U.S. Department of Commerce, Gaithersburg, Md., ordered tests of seven bolts marked as Grade 8. Six of those bolts, provided by the House subcommittee, were suspected of being foreign-made counterfeits. The seventh bolt was acquired from a U.S. bolt maker.

Of those seven bolts:

- Only one bolt (marked "LE," indicating a domestically-made product of the Lake Erie Screw Corp., Cleveland, Oh.) complied fully with SAE J-249.
- Two bolts with no maker's I.D. mark (lack of a maker's mark is a violation of SAE J-249), made of low-carbon martinsite steel, met Grade 8.2.
- Two bolts (marked "KS," indicating a product of Kosaka Kogyo Co. Ltd., Osaka, Japan) made of low-carbon martinsite steel, met Grade 8.2
- Two bolts (also marked "KS") made of low-carbon martinsite steel, only met Grade 5.2.

In a written report to Dingell, Krammer stated:

- In environments of 650°F or less, counterfeit Grade 8s that comply with Grade 8.2 specs can be expected to perform like genuine Grade 8s.
- At temperatures above 650°F, counterfeit Grade 8s that comply with Grade 8.2 specs can be expected to "degrade significantly" and lose a high percentage of their clamping force. In contrast, genuine Grade 8s retain most of their performance characteristics up to 800°F.
- Counterfeit Grade 8s which only meet Grade 5.2 specs break under a 20% smaller load than genuine Grade 8s or counterfeit Grade 8s meeting Grade 8.2 specs. Further, such counterfeits will permanently deform under a 30% smaller load than Grade 8s or counterfeit Grade 8s meeting Grade 8.2 specs.

Basically, that's why some counterfeit Grade 8s - those equivalent to Grade 5.2 - easily break or neck out while other counterfeits perform adequately. In like manner, some counterfeit Grade 5 bolts are no stronger than Grade 2 bolts.

The risks posed by poorly-made counterfeits should not be taken lightly. Even if they don't break immediately when torqued, such counterfeits may stretch permanently. This causes clamping force to plummet, permits nuts to loosen and may promote fatigue cracking of vehicle components.

Necked out bolts, when retightened, are likely to break because they are already stretched to the limit.

The 423-page report of House subcommittee hearings on counterfeit bolts is cause for concern. Charles Wilson, director of engineering for the Industrial Fasteners Institute (IFI) - a Cleveland-based trade association of North American bolt makers and allied industries - testified that North America appears riddled with counterfeit Grade 8s. And Grade 8s typically are used in critical applications, such as 5th wheel mounts.

As proof that counterfeits are widespread, IFI acquired 50 imported Grade 8 bolts from around the country. When the bolts were sent to Herron Testing Laboratories, Cleveland, Oh., IFI learned that only 11 of the Grade 8s were in full compliance with SAE J-429. The 39 other bolts were low-carbon counterfeits, displaying the following I.D. marks of Asian makers: FM; H; KS; M; MS; NF; RT.

Based on those results and prior testing, IFI sounded the alarm by distributing a list of the I.D. marks found on counterfeit Grade 8s to its member companies and allied distributors.

Testifying before the House subcommittee, Ken Teeple, president of Montana Bolt Inc., Missoula, Mont., said he unknowingly sold thousands of bogus Grade 8s to truck maintenance and repair shops in several states before receiving IFI's list of counterfeits and purging his stock.

In a telephone conversation with CCJ, Teeple said he sent a bogus Grade 8 bolt marked "KS" to Houston-based Texas Bolt Co. for a $200 lab analysis. "When the results came back, indicating that the 'KS' bolt tested well below Grade 8, I was very concerned. A lot of trucks on the road today may be held together by similar junk," he says.

Another bolt distributor who testified before the House subcommittee is Thomas Grant, president of Grant Fastener Inc., Houston.

In a telephone interview with CCJ, Grant said he helped the Harris County Metropolitan Transit Authority bus fleet purge its bins of substandard bolts. He bemoaned the fact that honest bolt distributors and their fleet customers continue to be victimized by dishonest U.S. importers.

Grant's implication that the influx of substandard bolts is far from accidental is supported by testimony presented to the House subcommittee by William Rosenblatt, assistant commissioner of the U.S. Customs Service's Office of Enforcement, Washington, D.C.

Rosenblatt testified that counterfeit bolts are imported (as finished products or blanks that require cutting, threading and heat treating) by off-shore companies under direct contract to domestic importers.

Additional testimony by representatives of U.S. Customs indicates that Korea and Taiwan may have taken the lead in counterfeiting fasteners for export to the U.S. Reportedly, that's because the leading Japanese bolt makers appear to have cleaned up their act after being visited by outraged U.S. government officials.

According to Steve Sims, special assistant to the House subcommittee, legislative countermeasures are being pursued. A few months ago, Sims circulated a draft legislative proposal to IFI, selected test labs and other concerned parties, asking for comment. A House bill designed to thwart the tide of counterfeit fasteners, is expected to be introduced by next month.

In the meantime, many distributors and retail suppliers unknowingly continue to sell a mixture of counterfeit and up-to-spec imported bolts to motor carriers.

According to Sims, it is unlikely that those distributors and suppliers know they're selling counterfeits, for one thing, there's nothing inherently inferior about foreign-made bolts. And it's common practice for dishonest importers to falsify certification papers and laboratory test results that indicate total compliance with SAE J-429 and/or comparable industry specs, Sims says.

Enforcement of countermeasures may prove difficult because counterfeiters are resourceful, Sims tells CCJ. In one case under investigation by federal authorities, fasteners made in Japan, Korea, Taiwan and Poland were being sent into the U.S. in cartons labeled "Made in Canada."

In other instances, bolts with Canadian marks are showing up in boxes marked "Made in USA," according to Sims.

In addition, counterfeiters have expanded their product line by producing high priced, stainless steel bolts. Some of these bolts begin to rust while still in the distributor's stockroom, according to IFI.

"Consequences [from the influx of counterfeits] have been so grave that the U.S. Government now requires traceability for any fasteners it purchases," notes Michael Osler, customer service manager, Dorman Products – a Cincinnati based supplier of bolts and other hardware. That is, manufacturer's head marks must be present and traceable to a specific source.

However, the lack of a maker's mark does not necessarily indicate a substandard bolt, insists Tony Fidgeon, senior product design engineer, Fontaine Fifth Wheel Co., Birmingham Ala. Fontain uses Grade 8 bolts with no maker's marks but tests each batch for compliance with SAE J-429, Fidgeon says. But any OEM who fails to take that precaution is asking for potentially serious trouble, he admits.

Typically, Grade 5 and Grade 8 (or comparably-spec'ed metric) bolts sold in the U.S. display a maker's I.D. mark. A mark may indicate:

- a U.S. bolt maker;
- a foreign bolt maker;
- a U.S. importer who has contracted with a foreign bolt maker to affix the importer's mark and desired grade marks;
- a Canadian bolt maker which, under contract to one or more U.S. importers, sub-contracts with one or more off-shore suppliers to affix a Canadian mark and SAE grade marks;
- a dead end. That is, a bolt that can't be traced using standard references listed under "For more information."

For a fleet that buys hardware from numerous suppliers on a low bid basis, tracking the origin of a bolt is likely to be difficult, if not impossible. Many domestic and foreign bolts display virtually identical, single-letter maker's I.D. marks. An "A" mark, for example, is especially widespread.

For example, some Grade 5 bolts tested and sold by Dorman Products are marked "DORMAN" while others are marked: "KY" (Kyoei of Japan); "A" (presumable Asahi of Japan); "FX" (Flexalloy of Ohio, which imports hardware from Japan, Taiwan, Canada, Korea and China, according to the House subcommittee hearings); "LS" (RB&W Co. of Ohio).

As another example, Sharon Fasteners Corp., Ashland, Mass., labels its mixed-bag boxes of Grade 5 bolts as being sourced from Japan, Taiwan, Italy, China, West Germany and India.

In the final analysis, a fleet has three options for protecting itself:

- Purchase bolts with maker's marks easily traced to domestic suppliers.
- Purchase bolts from a single, reputable distributor.
- Retain failed bolts, record the maker's marks and adjust purchasing habits accordingly.

**Threat Two: Bad maintenance**

A word of warning: Before ascribing any or all failures of replacement bolts or studs to substandard hardware, be sure inaccurate torquing and other maintenance shortcomings aren't to blame.

Even the best imported or U.S.-made replacement bolts and studs can fail if improperly applied to vehicles. OEM bolts always should be replaced with bolts of the same or higher grade.

Torque gremlins range from airstarved impact wrenches to cheater bars suitable for pole vaulting. By applying too little or too much torque, they can break or deform bolts and loosen the nuts on steel disc wheels.

Nuts on steel disc wheels, which require twice as much torque as nuts on cast spoke wheels or demountable rims, may loosen under the following circumstances.

- *Problem:* Wheels with a heavy coat of white paint look nice and make it easy to spot a leaking oil seal. Unfortunately, paint also invites wheels to loosen, since a 3/1000 in. coat of paint around bolt holes can reduce lug nut torque by 50% within 100 miles of travel. That's because paint tends to compress and wear off.

*Solution:* Remove excess paint from bolt holes before mounting.

- *Problem:* Tire men have repeatedly over-torqued a wheel, causing raised edges at the bolt holes. Raised edges prevent nuts from getting a good grip and won't permit duals to seat properly.

*Solution:* Grind off raised edges before mounting, being careful not to damage countersunk ball seats. If studs are breaking, switch to Grade 8 studs/nuts and avoid over-torquing. Use a torque wrench for final tightling.

- *Problem:* Something or someone has reduced air pressure to the impact wrench used to mount wheels, causing torque to be inadequate. Conversely, excessive air pressure may result in excessive torque and broken studs.

*Solution:* Periodically check impact wrench performance by testing torque of newly-installed nuts with a torque wrench. If torque is incorrect, adjust the air regulator. If that doesn't work, check the wrench because it may be worn-out or inherently under-powered.

- *Problem:* Air pressure to a wrench is periodically reduced by operating another air stealing device (such as a vehicle lift) at the same time.

*Solution:* Install an in-line pressure gauge that a tire man can monitor, or install an audible alarm to signal dangerously low air pressure.

- *Problem:* An impact wrench in the tire line has been replaced by one of identical size but vastly different performance.

At 100 psi line pressure, makes and models of wrenches with the same size of square drive can vary significantly:

Peak torque of ⅜-in. square drive tools may vary in peak torque from 60 ft/lb to 135 ft/lb.

Peak torque of ½-in. square drive tools – 90 ft/lb to 475 ft/lb.

Peak torque of ¾-in. square drive tools – 250 ft/lb to 1,100 ft/lb.

Peak torque of 1-in. square drive tools – 1,200 ft/lb to 2,000 ft/lb.

*Solution:* Replace impact wrenches with tools of known performance, adjusting line pressure to obtain the torque desired.

- *Problem:* Used lug nuts are retained, regardless of condition. Bowman Distribution warns that using a nut four to six times can reduce clamping force by 30% or more.

*Solution:* If one or more wheels on an older vehicle refuse to remain tight, try new nuts.

The first time a nut is used, its threads are slightly, but permanently, distorted. If the nut is removed and then applied with the specified torque, clamping force will be diminished. That's because some of the torque is consumed in overcoming the unusual amount of friction generated by the nut's distorted threads.

To illustrate the negative effect of repeatedly reusing a nut, Bowman Distribution conducted a lab test using a ½-in. diameter Bowmalloy nut and bolt, said to exceed Grade 8 requirements.

The first use of the nut, with the assembly torqued to 170 ft/lb, produced a clamping force of 13,250 lb. Subsequent applications provided the following results:

Second use: 12,500 lb;
Third use: 11,500 lb;
Fourth use: 10,700 lb;
Fifth use: 9,200 lb;
Sixth use: 7,500 lb.

Clearly, progressive decline of clamping force could permit parts to shift, resulting in misalignment and a risk of fatigue cracking.

It's critical that high-grade bolts be used with nuts of the same or higher grade. If a lower-numerical-grade nut is mated with a Grade 8 bolt, for example, the nut's threads probably will distort before the desired amount of torque can be applied.

As a result, the nut is likely to freeze to the bolt, perhaps inducing the mechanic to use a cheater bar. At that point, it is easy to twist off the bolt head or strip the threads in the nut.

Similar problems can result from using a high-grade nut with a lower-grade bolt.

To properly complete an assembly, two flat washers should be used – one under the bolt and one under the nut. Washers prevent the nut or bolt from embedding in the work surface and make it easier to apply proper torque.

Washers are available in two basic sizes:

- "USS" washers are especially wide, so they're ideal for application to sheet metal or thin/soft materials. Typically, USS washer holes are wider than standard bolts.
- "SAE" washers are narrower. Holes match precisely with standard bolt widths. SAE washers are recommended for securing anything thicker than sheet metal.


SAE standards require that bolt head markings identify grade and source. From left: Grade 5/origin unknown; Grade 8/Infasco of Canada; Grade 5/Dorman Products, Cincinnati, Oh.; Grade 8/Rockford Products, Rockford, Ill., Bowmalloy super bolt (exceeds Grade 8) Bowman Distribution, Cleveland, Oh; L9 super bolt (exceeds Grade 8) RB & W Corp., Mentor, Oh.; metric Property Class 8.8 bolt (roughly equivalent to SAE Grade 5)/LOBO SpA, Italy. Most common counterfeit Grade 8's are marked: FM, H, KS, M, NF, or RT.

USS and SAE washers may be soft or hard. Specifically:

- "Wrought" washers are soft and easily distorted. When used with high-grade bolts and nuts, they compress progressively and make it impossible to apply and/or retain proper torque. For that reason, they're too weak for heavy-duty applications.
- "Hardened" or "heat-treated" washers have a tough surface finish and are somewhat thicker. They are the only choice for heavy-duty applications.

Even hardened washers are produced by stamping, however, and may have a sharp edge on one side. Always place the sharp-edged side against the work surface to prevent it from slicing into (and weakening) the bolt head.

Many mechanics think split lock washers belong in the same league as motherhood and apple pie. But they have their limits, according to Bowman Distribution.

- Electroplated, poorly-made lock washers are prone to crack during assembly, or shortly thereafter. All lock washers aren't created equal.
- Lock washers can damage bolt heads and encourage fatigue failure.
- Used under a nut that becomes loose in a harsh operating environment, cheaply-made lock washers are prone to flex themselves to pieces and fall off. So SAE recommends not using split lock washers in critical vehicular applications.

Torque values for nut and bolt assemblies only apply to turning the nut, not the bolt head. If the bolt head must be torqued while restraining the nut, increase the recommended torque by 20%.

Further, torque charts are for clean and dry threads, unless otherwise noted. Lubricated bolts or nuts require a reduction in recommended dry torque. For example:

- Bowman Anti Seize Compound: 40% reduction;
- heavy oil or graphite: 30% reduction;
- synthetic white lead: 25% reduction;
- Loc-Tite compounds: 23% to 28% reduction;
- various light oils: 18% to 24% reduction.

Contrary to popular belief, lubricating a nut or bolt and applying it with lower torque will not reduce clamping force or make the assembly prone to vibrate loose, according to Bowman Distribution.

### Management Bottom Line

- Dangerously sub-standard bolts are flooding the U.S.
- Buy bolts with maker's marks traceable to domestic sources.
- Or purchase bolts from a single, reputable distributor.
- Even top-quality bolts may fail if improperly torqued.

For a free single copy of this article, write on company letterhead to:

Editor, Commercial Carrier Journal,
Chilton Way, Radnor, Pa. 19089

Reprinted by J.H. Fletcher & Co. from *Commercial Carrier Journal*, June 1988, Copyright Chilton Co.

# Pocket Guide To Adjusting The Fletcher 31538

One of the most frequently asked questions by our customers is, "How do we adjust the drill control valve package on our bolter?" To rectify this problem, J.H. Fletcher & Co. has developed a pocket guide brochure to adjusting the 31538. This guide will provide a clear picture of the 31538, a simplified hydraulic circuit , and suggested tools you may need for the job.

To order your pocket guide, please contact the Safety Department and ask for David Cooper or Lisa Schafer. Copies of the pocket guide will be forwarded to you at no charge.

# SAFETY RECALL

## (MP130A RELAY)

All J.H. Fletcher & Co. roof bolters manufactured from February, 1978 through September, 1990 incorporated a MP130A slave relay unit which is part of the emergency shut down circuit. Due to the importance of the MP130A slave relay in the emergency shut down system, J.H. Fletcher & Co. and Service Machine Co. consider it of vital importance that all relays which might have a latent defect be replaced immediately to reduce the risk of injury or death to personnel. If you have not already received a notification letter on relay recall from J.H.& Fletcher & Co., please contact David P. Cooper at (304) 525-7811.