Mismatched Iron Connections

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Mismatched Hammer Unions – Ongoing Issue

ALERT 00-15
ADDITIONAL SERIOUS INCIDENTS WITH MISMATCHED HAMMER UNIONS

WHAT HAPPENED:

MISMATCHED HAMMER UNION RESULTS IN A FATALITY

WHAT CAUSED IT:

Avoiding the Dangers of Mismatching Hammer Unions

Hammer Unions, also called “Wing” Unions, are quick make-up and break-off pipe couplings that have been used in the oil industry since the early 1940s. The primary components in these connections are a male nut with a spherical seating surface and a female nut with a central cone, and a wing nut with internal cone threads to hold the components together. Depending on the pressure rating and size, the assembly may include a sealant ring. One version of these unions employs separate load transfer plates called segments, which are required to make quick make-ups.

The majority of these unions are manufactured using conventional pipe fittings and components that will work interchangeably. However, if these connections are not properly seated or component parts are mismatched, serious accidents can result.

ALERT 86-01
MISMATCHED HAMMER UNIONS STILLS BEING FOUND

WHAT HAPPENED:

MISMATCHED HAMMER UNIONS STILL BEING FOUND

WHAT CAUSED IT:

1. The wing nut shall be marked with the manufacturer’s name, model number, and inspection code.
2. The male nut shall be marked with a warning that states: “This union is intended for use with specific model numbers and components. Use of other parts may result in failure of the union.”
Pressure Rating & Figure Number

- Figure 602 – 6,000 PSI
- Figure 1002 – 10,000 PSI
- Figure 1502 – 15,000 PSI
- Figure 2002 – 20,000 PSI

Note: Sour Gas Service iron has a lower maximum working pressure for a given Figure number (based on material properties). Standard Service components should not be used in Sour Service, due to differing material properties.
High Pressure fluid transfers are conducted via fixed HP Rig manifolding and/or temporary HP (dumb) Iron.

- Fig 602 – 6,000 psi
- Fig 1002 – 10,000 psi
- Fig 1502 – 15,000 psi
- Fig 2002 – 20,000 psi
What are “Weco Hammer Unions”?  

- They are connectors for temporary pipe & flow line installations
- FMC acquired the original Weco company in the 1950’s
  - The design is old, and manufactured by many companies
  - Used in steel & chemical plants, dredging vessels, strip mines & in the oil industry
- More than a dozen design variations
  - Designated by nominal pipe & a ‘Fig’ number
  - 2” 1502
Definitions

- Detachable Wing Nut
- Segments (3 required)
- Female Sub
- Male Sub
- Wing Nut
- Wing Half
- Thread Half
A 2" 1502 Wing Nut will make up to a 2" 602 or 1002 thread half but will fail ... explosively.

<table>
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<th>Series</th>
<th>Working Pressure (dia - inches)</th>
<th>Nominal Pipe Sizes (dia - inches)</th>
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<td>2202</td>
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<td>2, 2 1/2, 3</td>
</tr>
</tbody>
</table>

Potentially Fatal Combinations

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The Hazards

A 2” 1502 Wing Nut will make up to a 2” 602 or 1002 thread half and will hold some pressure! However ... ... it will fail explosively.

- 4 1/8” Nominal Thread Diameter
- 3 Threads per Inch
- Standard Acme 2G Thread Form

- 3 13/16” Nominal Thread Diameter
- 3 Threads per Inch
- Stub Acme 2G Thread Form
Dangerous Union Connection

- Same iron size *BUT* different Figure number and different pressure rating. Examples:
  - 2” 602 thread half & 2” 1502 wing half
  - 2” 1002 thread half & 2” 1502 wing half

Note the minimal thread engagement of wing nut thread and female sub thread.

This combination will make up, but will fail under pressure.

Photo Courtesy of FMC
Mismatching Swivel Joints

FMC Technologies

Safety & Technical Alert

Avoiding the Dangers of Mismatching Swivel Joint Components
Mismatching Swivel Joints

Avoiding the Dangers of Mismatching

Figure 1: Dangerous Mismatch to be Avoided

Figure 2: Mismatch Avoided
Mismatching Swivel Joints

Swivel Joint Components

Figure 3: Matching Assembly

Figure 4: Identification of TripleStep Swivel Joint
Basic Practices / Issues

- All union connections must be positively identified as compatible for size, Figure number and pressure rating prior to assembly. Ensure iron qualification band is present, accurate and current.
- Damaged union connections must be immediately removed from service and rendered unusable.
- The dangerous connections presented here are an Industry-wide problem. These dangers are most likely when connecting to iron from multiple companies (Contractors – Customer – Rig) or by cross mixing manufactures union components.
- All companies should have iron maintenance and certification program.
List of DON’TS

- Do NOT use 2” 602/1002 union components in pumping service
- Do NOT mix Standard Service and Sour Service components
- Do NOT use Standard Service components in Sour Service
- Do NOT use line pipe connections greater than 1” nominal.
- Do NOT use de-rated pipework
Risk Mitigation Ideas

- Stringent Industry / Company guidelines/policies on iron-management processes. Requires commitment & strong controls mechanisms.

- Increase focus/awareness at field level through training/on site induction discussions/tool box meetings/display posters. SOP’s/JSA’s to address mismatched iron. Human dependence.

- Move away from the use of 602’s. Do we need them? Challenge with some operators.

- Clearly tag/label iron. Identification.

- Mandate the use of go-no-go gauges. Perhaps the last line of defense!
GO / NO-GO Gauges

• When there is uncertainty – use the GO / NO-GO Gauge to ensure it is a 1502 Thread Half (female union).

• Identify markings

Types of Go-No-Go Gauges
GO / NO-GO Gauge Usage Procedure

• If the gauge fits over the threads as shown below, the connection is unsafe; do not use.
GO / NO-GO Gauge Usage Procedure

- If the gauge does not fit over the threads as shown below, the connection is safe.
Questions/ Comments