

Advanced Services

amtec



Monitoring of Relevant Loads,

CORRECT

Testing of Packing Materials,

FUNCTION OF

Test Rigs for Packings, Tools for Assembly,

STUFFING BOX

Monitoring of Fugitive Emissions,

PACKINGS

Joint Integrity Management Systems

amtec

Advanced Tools and Comprehensive Services for
the Reduction of Fugitive Emissions



In a lot of valves, stuffing box packings are used to tighten between the valve stems and the housings. A correct function of this type of tightening joint is given, if integrity and tightness are maintained in every state of operation (leak rate remains below given limits) and the stem can be moved easily (limited friction forces).

Function of Stuffing

Box Packings

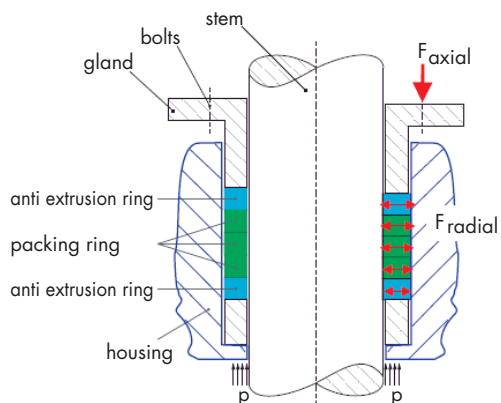
Integrity means that the stresses in the parts are limited. This is an essential task of the design of a valve.



Tightness usually is achieved by an axial compression of the stuffing box packing using a gland and bolts. The axial compression induces a radial stress between packing and stem and between packing and housing. This radial stress keeps the joint tight. Regarding demands on tightness, a high radial stress should be applied.

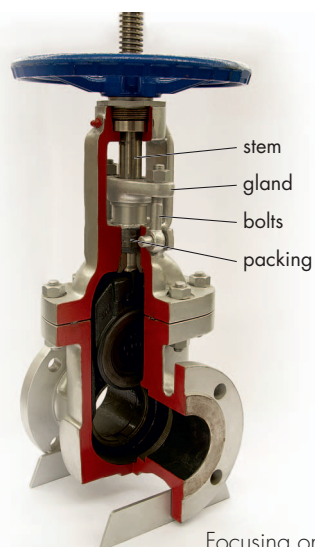
However, the radial stress has to be limited on the upper end in order to limit friction between the stem and the packing. Extensive friction could lead to a malfunction of the valve.

- ■ ■ ■ ■ ■ ■ ■ ■ ■
- TIGHTNESS**
- INTEGRITY**
- LOW FRICTION**



Therefore, to achieve correct function of a stuffing box, the deformation capability and the friction factor of the packing material have to be known in detail. Then – and only then – the necessary tightening (pre-) stress value of the bolts and the resulting friction forces can be determined in a reliable manner.

The calculated bolt assembly stress value has to be applied during the assembly procedure of the stuffing box packing, finally.



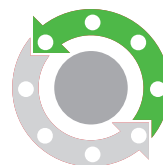
As experience shows, leakage from valves is the major cause of unanticipated emissions on petrochemical or chemical sites. Environmental legislation and regulations have become more stringent in recent years, "best available technology" is demanded to minimize emissions, the given time schedules are tight. On this background, the reduction of fugitive emissions is a challenge for industry.

Demands on Stuffing Box Packings

Focusing on tightening joints to meet the ecologic demands can result in economic benefits, too. Even if the true costs of shutdowns due to leakages are rarely known, it is no doubt that a reduction of such events reduces costs. Additionally, a reduction of fugitive emissions minimizes the loss of usually valuable materials.

ECOLOGIC & ECONOMIC TASK: MINIMIZE EMISSIONS

According to the **amtec** philosophy, the "best available technology" to minimize emissions is to apply an integral procedure, like a quality improvement circle. The analysis steps in this circle should be passed through preventively and iteratively, if necessary.



**APPLY INTEGRAL PROCEDURE
PACKING CHARACTERISTICS
ASSEMBLY / TIGHTENING
CHECK OF FUNCTION
REVIEW EXPERIENCE**

Regarding stuffing box packings, it is necessary to know the relevant loads in every state of operation. The design of the tightening joint has to be optimized. The most suitable packing has to be selected on the basis of detailed knowledge about the behavior of the material. With this information the assembly bolt (pre)-stress value can be calculated. This assembly bolt stress has to be applied during tightening in a reliable manner. And last but not least the operating experience has to be fed back into this quality improvement circle.



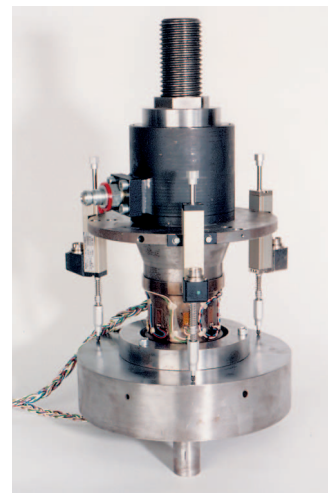
amtec offers comprehensive tools and advanced services for every aspect of this analysis. If you do care about stuffing box packings, the advanced tools and services of **amtec** should be your choice.



Material Characteristics

Detailed data about material characteristics are necessary for the selection of the most suitable packing material for a given application as well as for stress (integrity), tightness and friction analysis purposes. Such data include:

- deformation characteristics,
- tightness behavior,
- friction factor,
- long term behavior,
- resistance against wear,
- resistance against corrosion.



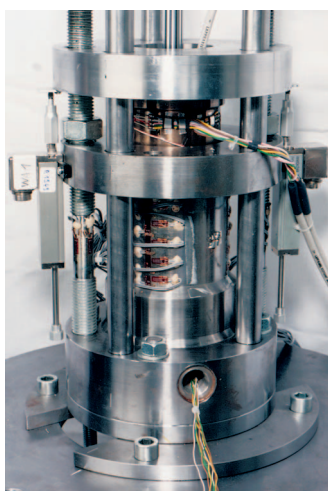
TESTING OF STUFFING BOX MATERIALS

TEST RIGS FOR STUFFING BOXES

QUALITY CONTROL

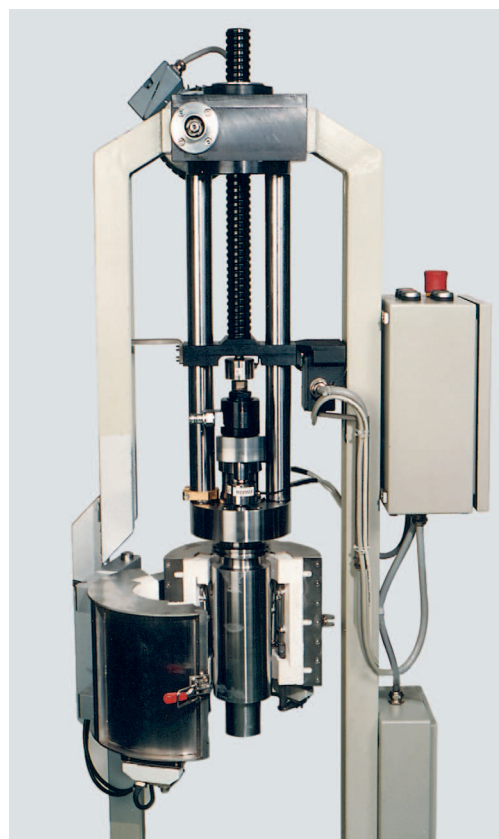
For the determination of the relevant packing material characteristics it is necessary to perform

- compression tests,
- creep relaxation tests,
- leakage tests, and
- wear tests.



amtec is taking active part in research projects, in codes and standards working groups and more important – on site; this guarantees that the latest development in knowledge is taken into account.

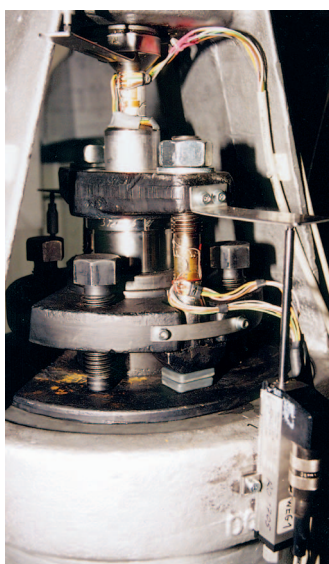
amtec has developed test rigs for every relevant characteristic factor (e.g. transmission factor, friction factor, deformation capability). These test rigs are ideal quality control tools for end users that operate a lot of valves and for packing material manufacturers.





In addition to the test rigs to determine all relevant packing material characteristics, **amtec** developed a testing equipment for valves, **TEMES^{valve.teq}**, e.g. to check function and tightness of the stuffing box packing and the housing cover sealing. Using this test rig, type tests can be performed for valves, valve stem packings, etc.

Valve Testing Equipment



Regarding safety relevant valves, it is often necessary to prove function which means in most cases a check of stem friction forces during planned outages. On the basis of monitoring results, the relevant parameters can be evaluated and assessed. If the assembly and tightening procedure is reliable and repeatable, anomalies of the actuator, the gear box, the transmission or the packing can be identified.

Valve Diagnostics

amtec performs emission measurements as demanded in several national and international regulations. This can be done on site (e.g. according EPA 21 or VDI) or in specific tests in our labs.

Monitoring of Emissions

Monitoring is not only restricted to stuffing box packings. Every tightening joint can be checked by these methods.



**CHECK OF EMISSIONS
ACCORDING TO EPA 21
OR VDI IN OUR LABS
OR ON SITE**

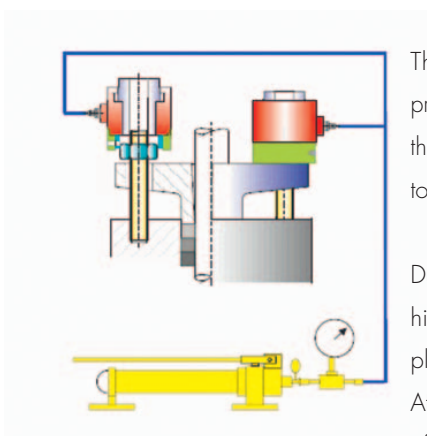


Assembly and Tightening

The assembly procedure (incl. disassembly) must be regarded as an important step in quality control of the tightening joint. This can only be performed, if the assemblers are qualified. Experience made during disassembly and assembly has to be fed back into the analysis of the joint.

The tightening procedure has to meet the demands on the function of the stuffing box (integrity, tightness, friction).

If the demands are high, the **amtec TEMES_{stb.ctrl}** procedure is an option to consider.



The tightening of a stuffing box according to the **TEMES_{stb.ctrl}** procedure can be divided into two steps: a pre-deformation step and the final application of the given assembly stress value (tightening torque).

During the pre-deformation step, the applied force can be significantly higher than the final tightening force, thus accelerating necessary plastic deformations to fill all gaps and to get an optimal seating. After successful pre-deformation, the force-deformation characteristic of the packing is repeatable. The packing is ready for final tightening.

Hydraulic tensioners are ideal tools for this type of tightening of stuffing

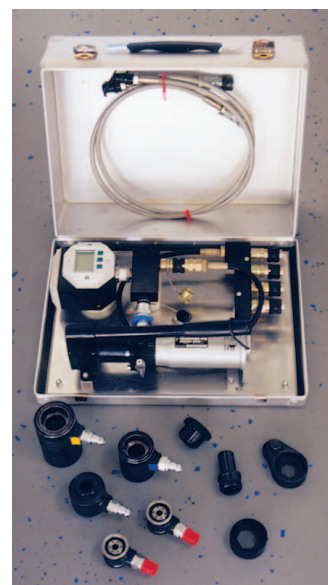
**QUALIFIED ASSEMBLERS
HYDRAULIC TIGHTENING**

**ALL BOLTS ARE LOADED
SIMULTANEOUSLY**

**PRE-DEFORMATION AND
TIGHTENING**

boxes. Compact tensioners are tailored to fit on almost every construction; a small set of different tensioners and adapters is enough to cover quite a number of different valves.

Using hydraulic tensioners, all bolts of the gland can be tightened at the same time and the packing deformation is uniform. Furthermore hydraulic tightening (**TEMES_{stb.ctrl}** procedure: high pre-deformation for good seating, final tightening stress level below pre-deformation value) is even less time consuming than other methods.






If the demands are stringent, e.g. regarding stuffing boxes in systems with dangerous or poisonous media, an explicit control of successful tightening may be necessary, additionally to the use of hydraulic tensioners.

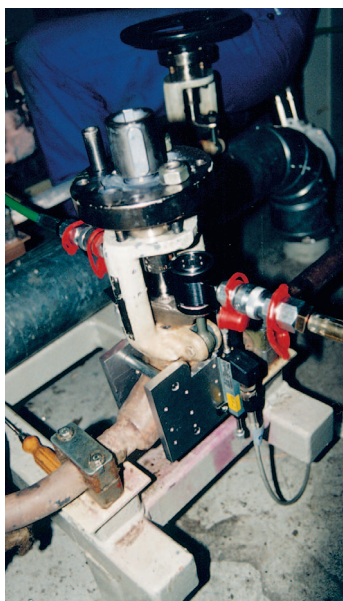
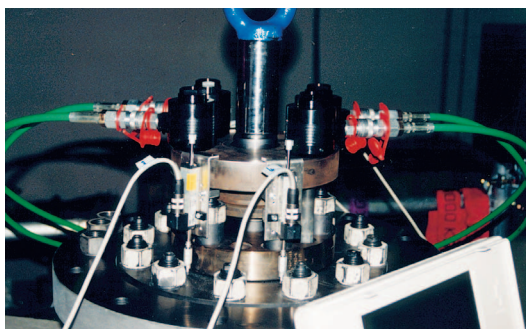
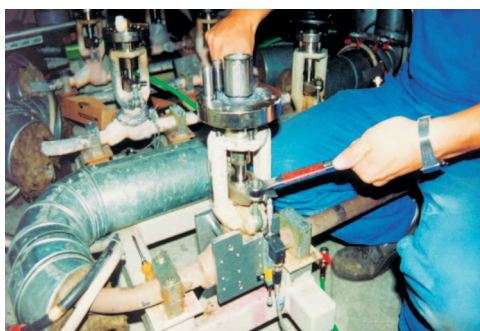
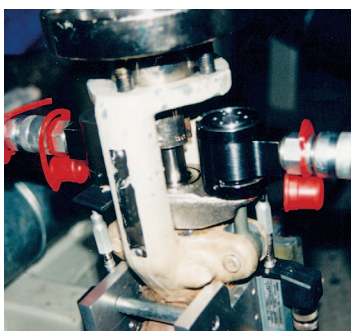
As the force vs. deformation characteristic of the packing is repeatable after successful pre-deformation, the deformation can be used to check or control the applied tightening force.

In very sensitive cases (e.g. in nuclear power plants), the force vs. deformation is recorded continuously. Thus, the whole tightening process is documented.

Assembly and Tightening



HYDRAULIC TIGHTENING CONTROL OF ASSEMBLY STRESS DOCUMENTATION





amtec has many years of field experience regarding tightening joints. On this base, **amtec** is following an integral philosophy to realize reliable function of stuffing box packings. Competent consulting is one of our services.

Training, Consulting



COMPREHENSIVE

Hands-on training can be provided in our labs as well as directly on site. Visit our website for actual dates of training courses and workshops.



PROTECT ENVIRONMENT



MINIMIZE EMISSIONS



quality certified ISO 9001

amtec provides advanced tools and services for:

- stuffing box packings
- valve integrity
- gasketed flanged joints
- integrity analysis of piping systems and vessels



amtec

amtec Services GmbH

Hoher Steg 13
74348 Lauffen/N.
Germany

phone +49 7133 9502-0

fax +49 7133 9502-22

info@amtec.eu

www.amtec.eu

