With conventional, gasketed pipe joints bolts must be preloaded high enough for the gasket to compress such that a no-leak condition is achieved.

(1) Introduction

It is commonly believed, **(ref. 1),** that there must be a certain amount of contact pressure for a non-gasketed joint to be tight. However, it has been suggested, **(ref. 2),** that the flow between two flange surfaces, if their distance from each other is small, is purely laminar and accordingnly proportional to that distance or ”channel height”. It follows, that if that height is zero, then the flow also will be zero, even if there is no contact pressure between the flanges.

The aim is to verify the above statement by a simple, exploratory experiment.

(2) Test rig

Two disks, 24 mm thick / 150 mm outside diameter, both having a 50 mm diameter recess in the centre, were ground flat. Three holes diameter 6,5 mm were drilled equally spaced 15 mm from the outside, for M6 bolts to clamp them together. In each test shims of various thicknesses were installed between the plates. Cold water from the household supply was connected to the one side and a pressure gauge to the other. Three measurements were made with each set of shims.

Using a stop-watch the time to fill a bucket with water, leaking from the assembly, was measured. The weight of the water collected in the bucket was noted and also the water pressure during the test.

(3) Data processing

It was presumed, that flow was directly proportional to fluid pressure. By dividing the amount of leakage in gram by the time in second and by the pressure in bar, a significant figure related to channel height / shim thickness, was arrived at.

The figures were plotted against height and a best fit model was established by using a Hewlett Packard type 42S calculator, **(ref. 3).**

(4) Results

Water [gram	Time [sec]	Flow [g/s]	Pressure [bar]	Unit flow [g/s@1 bar]	Height [mm]
2’160	56	38,9	3,1	12,5	0,07
2’450	58	42,4	3,5	12,5	0,07
2’035	61	33,4	2,8	11,9	0,07
2’075	154	13,5	3,0	4,5	0,045
2’400	151	15,9	3,4	4,7	0,045
1’975	149	13,3	3,0	4,4	0,045
2’555	609	4,2	3,5	1,2	0,03
2’175	594	3,7	3,2	1,14	0,03
2’475	614	4,0	3,6	1,12	0,03
370	480	0,77	3,1	0,25	0,015
445	725	0,61	2,9	0,21	0,015
775	965	0,80	3,7	0,22	0,015

By using regression analysis, the above data were processed and ”a best fit” model was found, where y is unit flow and x is height

$y = B \cdot x^M$ and B = 14’190 M = 2,6

The correlation coefficient for this ”power-curve” is = 0,9973

(5) Conclusion

The results from this exploratory experiment do agree with the above statement, saying that if the distance between two flanges is zero, then the flow also is zero.

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(6) References

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2. MEMO,”An analysis of the effect of contact surface damage”, VERAX Dnr: 9807.19
3. Hewlett Packard Manual 42S, Chapter 15, p.239-244.

