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Transmission of Guide Load for Column Connected Clip

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Abstract*—The pipe connected to the column is a standard component of most hydrocarbon processing complexes. This vertical pipeline connected to the column nozzle is either skewed or in line with the global axis. It is essential that in both the cases the guide loads of vessel clip are conveyed correctly to equipment design engineer.*

This paper intends to compare the results obtained from the two instances, viz.

(1) The vertical pipe connected to the column is not inline to the global axis.

(2) The vertical pipe connected to the column is in line to the global axis. This paper explains the results with a solved example, and these results are useful while transmitting guide loads of vessel clip to equipment engineer for designing the column.

Keywords—Skew vessel clip guide loads.

I. INTRODUCTION

For vertical pipe connected to Column nozzle, usually, the vessel clip from vessel bracket supports the pipe. Vessel clips are attachments used for supporting pipes and are welded or bolted to the support brackets mounted on the vessel. The loads on vessel clip are used to determine the vessel wall thickness. It is essential for a piping engineer to impart accurate vessel clip loads. A popular stress analysis program is used to model and review the results. This program uses center line modeling approach for column and vessel clip.

Usually, an analyst models vessel clip as a rigid element from pipe centerline to vessel centerline breaking the aspect at outer vessel diameter. This method is used to differentiate temperature of a rigid portion between inside and the outside of a vessel wall. During analysis, an analyst model the vessel clip at ambient temperature from the vessel wall to pipe wall.

Case Study

Consider a case where the vertical pipe connected to the column (along with vessel clip) is skewed to a global axis as shown in Fig.2.Thispipeis guided from vessel bracket as shown in Fig.1 at node 730. This system is modeled and analyzed using pipe stress analysis software.

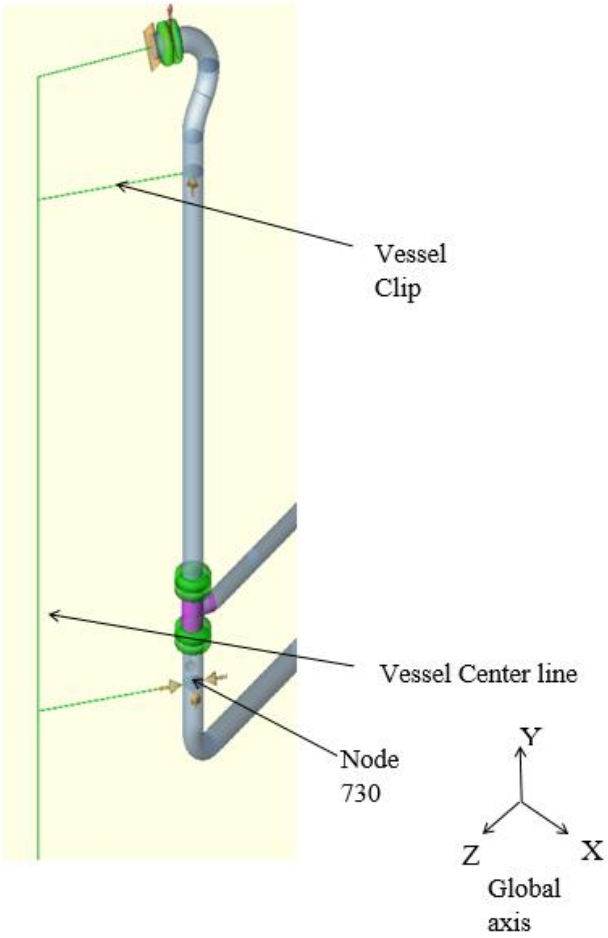

Fig.1: Model showing isometric view of piping connecting equipment column/vessel

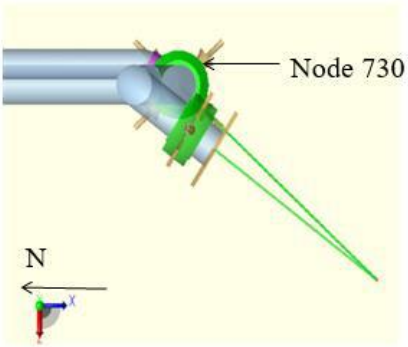

Fig. 2: Plan view of model showing vessel clip skewed about global axis

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Table-I: Summarizes the results of skewed model

730	Load Case	Rigid Z; Rigid X					
		Fx	Fy	Fz	Mx	My	Mz
		lb.	lb.	lb.	ft. lb.	ft. lb.	ft. lb.
	1(HYD)	124	0	90	0	0	0
	2(OPE)	-2679	0	87	0	0	0
	4(OPE)	-2686	0	-8	0	0	0
	6(OPE)	2403	0	73	0	0	0
	8(SUS)	137	0	97	0	0	0
	9(SUS)	137	0	97	0	0	0
	MAX	-2686		97			

Table-I shows results of the skewed model. It is noteworthy that while transmitting the guide loads for the vessel clip to equipment designer, these guide loads of vessel clip have to be resolved in the axial and lateral component as shown in Fig. 3.

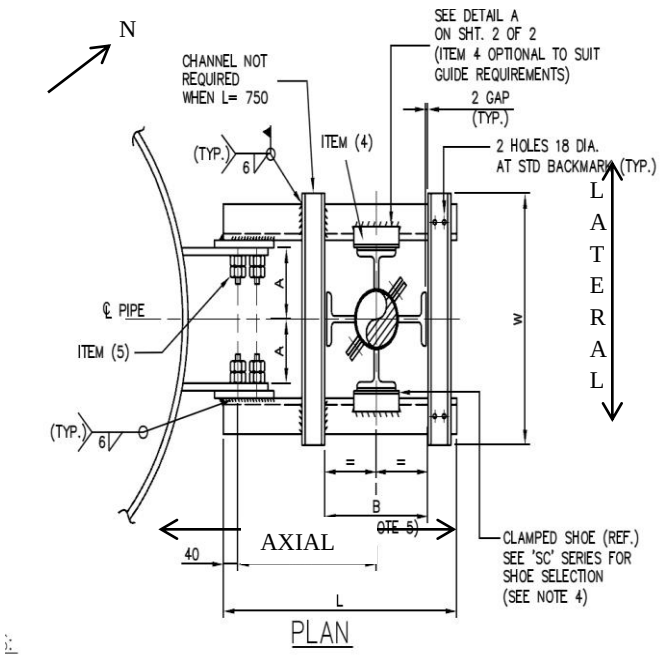

Fig. 3: Pictorial view of Guide arrangement for pipe from Vessel clip

Let us see how these loads can be resolved inline to a global axis before relaying them to the Equipment Designer.

It is vital that while transmitting the guide loads of vessel clip, it must be oriented inline to a global axis. The model is rotated in the suitable direction to match the vessel clip axis with the global axis in the program as shown in Fig. 4.

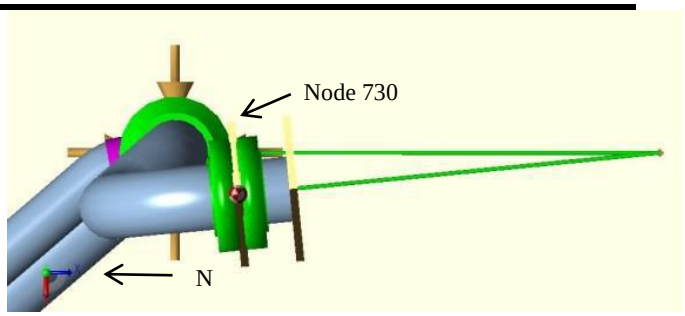

Fig. 4: Plan view of rotated model showing vessel clip along global axis

Table-II: Summarizes the results of model when vessel clipaxis is in line to the global axis

730	Load Case	Rigid Z; Rigid X					
		Fx	Fy	Fz	Mx	My	Mz
		lb.	lb.	lb.	ft. lb.	ft. lb.	ft. lb.
	1(HYD)	153	0	-12	0	0	0
	2(OPE)	-1977	0	1810	0	0	0
	4(OPE)	-2043	0	1743	0	0	0
	6(OPE)	1871	0	-1509	0	0	0
	8(SUS)	167	0	-15	0	0	0
	9(SUS)	167	0	-15	0	0	0
	MAX	-2043		1810			

The results achieved in Table-II are the resolved values of Table-I along the axial and lateral direction of vessel clip.

Abbreviations and Acronyms

(a) X, Y and Z, are the Global axes of the program.
(b) Fx, Fy, and Fz are Forces generated by the application in X,Y and Z direction respectively.
(c) Mx, My, and Mz are moments generated by the application in X,Y and Z direction respectively.
(d) N: Plant north

Load cases:

1. HYD: Hydro load case represents the loads acting on the pipe with water filled.
2. OPE: Operating load cases represent the loads acting on the pipe during hot operation.
3. SUS: Sustained load cases represent the initial force-driven loading acting on the pipe.

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II. CONCLUSION

In the design of vessel clip, the axial and lateral direction of vessel clip becomes a critical factor for transmitting accurate guide loads.

REFERENCES

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