In-Tank Eductors (CTE2)

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Management of Change

Management of Change (MOC) is a procedure used to proactively manage changes that have the potential to impact management of the products within a plant. Evaluating new techniques for improving MOC approval procedures can have an impact on plant efficiency. Historically, upgrading obsolete products or replacing existing process control equipment had been delayed or abandoned due to the extensive paperwork involved in completing a complex MOC approval sheet.

Background

Penberthy works to continuously improve product efficiency. The CTE2 continues in this tradition. The CTE2 uses the same pump flow as the CTE for all sizes across all pressures. The difference is that the CTE2 dramatically increases the pickup ratio.

Question & Answer Checklist

1 **Q:** Does this product modification cause any changes to the piping and instrumentation diagram (P&ID)?

A: No. The unit diameter and overall length changes, but since the unit is free at the end of a pipe, the P&ID does not change.

2 **Q:** Does this product modification change process chemistry, technology, or operating and control philosophies?

A: **Yes. The increase in pickup ratio may help processes achieve the goal of mixing more quickly.**

3 **Q:** Have the operating and design limits of the proposed modification changed?

A: No.

4 **Q:** Have the codes and standards to which the new equipment has been designed changed?

A: No.

5 **Q:** Does this product modification change the Hazardous Area Classification?

A: No. There are no hazardous area classifications for in-tank eductors.

6 **Q:** Does this product modification introduce new equipment that needs to be operated and, has a new operations list been stated?

A: No. The new units operate and provide the same information as before.

7 **Q:** Does this product modification introduce new equipment items that require spare parts, training manuals, maintenance procedures or training to teach the maintenance department how to maintain them?

A: No. There are no spare parts, and the installation, threading on a pipe thread or bolting to a flange, are unchanged.
Note: Confirm the installation opening is large enough to put the larger diameter CTE2 into the tank.

8 **Q:** Does this product modification change the spares for existing pieces of equipment?

A: No.

9 **Q:** Does this product modification introduce new equipment items that require periodic predictive maintenance?

A: There is no change to the inspection requirements. Unit longevity within service will be the same as before or potentially longer.

10 **Q:** Does this product modification result in a change in appearance that could raise a question about form, fit, or function?

A: Yes.
The larger diameter increases pickup ratio but has absolutely no impact on the pump output. Unit longevity within service will be the same as before or potentially longer.

In-tank Eductor (CTE2) Quick Comparison Chart for 2025 and Newer Units

Attribute	2025 CTE2 compared to 2024 & Earlier CT Units
Overall Length	Same or Longer (see each size)
Unit Diameter	Larger in every case (see each size)
Pump flow	Unchanged for all sizes and all pressures (see Table 2)
Pickup ratio	Increased in every case (see Table 2)
Cast Iron	Discontinued, use Carbon steel
Bronze material	B62 now standard
Selection Guide	New selection guide in place, part number change eliminates possibility of incorrectly identifying version

Table 1. Attribute comparison between 2025 and new units versus 2024 and prior assemblies
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Size	Sizing Factor	Pressure Difference PSI (kPa)	10 (69)		20 (138)		30 (207)		40 (276)		50 (345)		60 (414)		70 (483)		80 (552)		90 (621)		100 (690)		120 (828)		140 (966)	
3/8	0.23	Inlet Flow GPM (cuMm)	7.1	(0.027)	10.0	(0.038)	12.3	(0.047)	14.2	(0.054)	15.8	(0.060)	17.4	(0.066)	18.7	(0.071)	20.1	(0.076)	21.3	(0.081)	22.4	(0.085)	24.6	(0.093)	26.5	(0.100)
		Outlet Flow GPM (cuMm)	35.0	(0.132)	50.0	(0.189)	61.0	(0.231)	71.0	(0.269)	79.0	(0.299)	87.0	(0.329)	88.0	(0.333)	98.0	(0.371)	91.0	(0.344)	92.0	(0.348)	94.0	(0.356)	96.0	(0.363)
		Max. Length Feet (Meters)	4.0	(1.22)	8.0	(2.44)	12.0	(3.66)	16.0	(4.88)	15.8	(4.82)	17.4	(5.30)	18.7	(5.70)	20.1	(6.13)	21.3	(6.49)	22.4	(6.83)	24.6	(7.50)	26.5	(8.08)
3/4	0.50	Inlet Flow GPM (cuMm)	15.4	(0.058)	21.8	(0.083)	26.7	(0.101)	30.8	(0.117)	34.5	(0.131)	37.8	(0.143)	40.8	(0.154)	43.6	(0.165)	46.3	(0.175)	48.8	(0.185)	53.4	(0.202)	57.7	(0.218)
		Outlet Flow GPM (cuMm)	77.0	(0.291)	109	(0.413)	134	(0.507)	154	(0.583)	172	(0.651)	189	(0.715)	192	(0.727)	195	(0.738)	197	(0.746)	200	(0.757)	204	(0.772)	209	(0.791)
		Max. Length Feet (Meters)	5.0	(1.52)	11.0	(3.35)	17.0	(5.18)	24.0	(7.31)	33.0	(10.1)	42.0	(12.8)	53.0	(16.2)	64.0	(19.5)	74.0	(22.6)	85.0	(25.9)	106	(32.3)	127	(38.7)
11/2	1.00	Inlet Flow GPM (cuMm)	30.8	(0.117)	43.6	(0.165)	53.4	(0.202)	61.6	(0.233)	68.9	(0.261)	75.5	(0.286)	81.5	(0.309)	87.2	(0.330)	95.5	(0.361)	97.5	(0.369)	107	(0.405)	115	(0.435)
		Outlet Flow GPM (cuMm)	154	(0.583)	218	(0.825)	267	(1.011)	306	(1.158)	345	(1.306)	378	(1.431)	384	(1.454)	389	(1.472)	395	(1.495)	400	(1.514)	409	(1.548)	417	(1.578)
		Max. Length Feet (Meters)	7.5	(2.29)	16.0	(4.88)	24.0	(7.31)	34.0	(10.4)	46.0	(14.0)	60.0	(18.3)	75.0	(22.9)	90.0	(27.4)	105	(32.0)	120	(36.6)	150	(45.7)	180	(54.9)
2	2.00	Inlet Flow GPM (cuMm)	61.6	(0.233)	87.2	(0.330)	107	(0.405)	123	(0.466)	138	(0.522)	151	(0.572)	163	(0.617)	174	(0.659)	185	(0.700)	195	(0.738)	214	(0.810)	231	(0.874)
		Outlet Flow GPM (cuMm)	308	(1.166)	436	(1.650)	534	(2.021)	616	(2.332)	689	(2.608)	755	(2.858)	767	(2.903)	778	(2.945)	789	(2.987)	799	(3.024)	818	(3.096)	835	(3.161)
		Max. Length Feet (Meters)	11.0	(3.35)	23.0	(7.01)	34.0	(10.4)	48.0	(14.6)	65.0	(19.8)	85.0	(25.9)	106	(32.3)	127	(38.7)	148	(45.1)	170	(51.8)	212	(64.6)	255	(77.7)
3	4.60	Inlet Flow GPM (cuMm)	142	(0.538)	201	(0.761)	246	(0.931)	283	(1.071)	317	(1.200)	347	(1.313)	375	(1.419)	401	(1.518)	426	(1.613)	449	(1.700)	491	(1.859)	531	(2.010)
		Outlet Flow GPM (cuMm)	708	(2.680)	1003	(3.797)	1228	(4.648)	1417	(5.364)	1585	(6.000)	1737	(6.575)	1764	(6.677)	1790	(6.776)	1815	(6.870)	1836	(6.950)	1880	(7.116)	1920	(7.268)
		Max. Length Feet (Meters)	16.0	(4.88)	34.0	(10.4)	51.0	(15.5)	73.0	(22.2)	99.0	(30.2)	129	(39.3)	161	(49.1)	193	(58.8)	225	(68.6)	257	(78.3)	322	(98.1)	386	(118)

Table 2. CTE2 Pump requirements, Total Flow, and Plume Length

Conclusion

Penberthy in-tank eductors meet or exceed all prior rated units and all units are fully interchangeable with current pumps.