Closed Transfers and other Cold Side Oxidation Mitigators

Presented by Mick Spencer

Closed Transfer

Definition: Movement of finished beer from Fermenter to Purged Keg without exposure to air.

Purpose: Minimize Oxidation

Closed Transfers are preferably used in conjunction with *avoiding exposure to O_2 at all times after yeast pitch.*

Closed Transfer Requirements

- Fermenter
  - Can handle at least 5 PSI pressure.
  - Hardware allowing CO_2 hookup
    - usually a corny keg post in some form
    - Racking arm or dip tube that can be fitted with a transfer hose
- Transfer Hose
  - avoid silicon
- Keg (purged)
- Spunding Valve (preferred)

Keg Purge

- CO_2
  - Repeated Pressure/Release Cycles

    -or-
- StarSan
  - Fill Empty (unassembled) Keg to overflowing with StarSan solution
  - Attach sanitized Dip Tubes/Posts/Lid
  - Push Starsan out with CO_2

Keg Purge with CO2

Purge Cycles	PPM O_2 (volume basis) in Headspace after Purging					PPB O_2 (volume basis) in Headspace after Purging				
	Purge Pressure (psi)					Purge Pressure (psi)				
	10	12.5	15	25	30	10	12.5	15	25	30
0	209500	209500	209500	209500	209500	209500000	209500000	209500000	209500000	209500000
1	124668	113208	103677	77560	68883	124668272	113208085	103677485	77559584	68883229
2	74187	61175	51308	28714	22649	74187008	61174561	51307975	28713552	22648684
3	44147	33057	25391	10630	7447	44146855	33057064	25391321	10630125	7446847
4	26271	17863	12566	3935	2449	26270702	17863135	12565672	3935408	2448510
5	15633	9653	6219	1457	805	15633046	9652751	6218507	1456939	805066
6	9303	5216	3077	539	265	9302839	5216083	3077419	539377	264704
7	5536	2819	1523	200	87	5535890	2818629	1522955	199684	87034
8	3294	1523	754	74	29	3294271	1523110	753681	73926	28617
9	1960	823	373	27	9	1960339	823047	372982	27368	9409
10	1167	445	185	10	3	1166549	444752	184582	10132	3094
11	694	240	91	4	1	694185	240332	91346	3751	1017
12	413	130	45	1	0	413092	129869	45205	1389	334
13	246	70	22	1	0	245821	70178	22371	514	110
14	146	38	11	0	0	146282	37922	11071	190	36
15	87	20	5	0	0	87049	20492	5479	70	12
16	52	11	3	0	0	51801	11073	2711	26	4
17	31	6	1	0	0	30825	5984	1342	10	1
18	18	3	1	0	0	18343	3233	664	4	0
19	11	2	0	0	0	10916	1747	329	1	0
20	6	1	0	0	0	6496	944	163	0	0

Atmospheric O2: 20.95% by volume. 1 Atmsophere = 14.6595 PSI

4-21-2018, VikeMan's version

Keg Purge w/CO2: Example, 6 cycles @ 30 PSI

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265 PPM sounds high, since comm'l breweries shoot for low parts per *billion* in packaged beer. But the 265 ppm in the example is *by volume* in a relatively non-dense gas mix. At this concentration, there's only ~ 0.0072 grams O_2 in a corny keg.

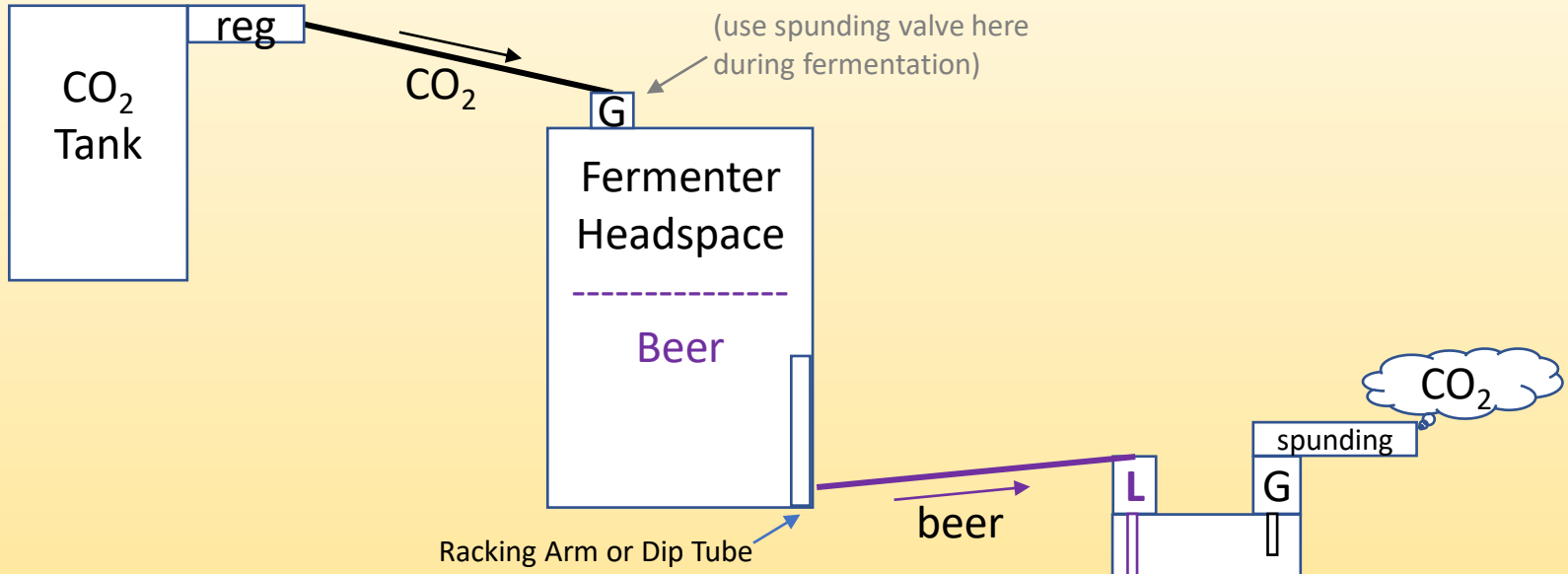
Much of that O_2 will be pushed out during closed xfer, but even in all of it were dissolved in the beer, that's only ~ 0.375 ppm by weight in 19L of 1.010 FG beer. That's a worst case scenario that won't actually happen. Reality is closer to 20 ppb, or even lower if the headspace is purged again after xfer.

Spunding Valve

- *Adjustable* Pressure Relief Valve
- Can replace an Airlock on Fermenter
  - "One-Way" only, so no O_2 ingress, even after fermentation slows
- Used on Keg Gas Post during Closed Xfer
  - Relieves pressure in keg as it fills, to keep beer flowing

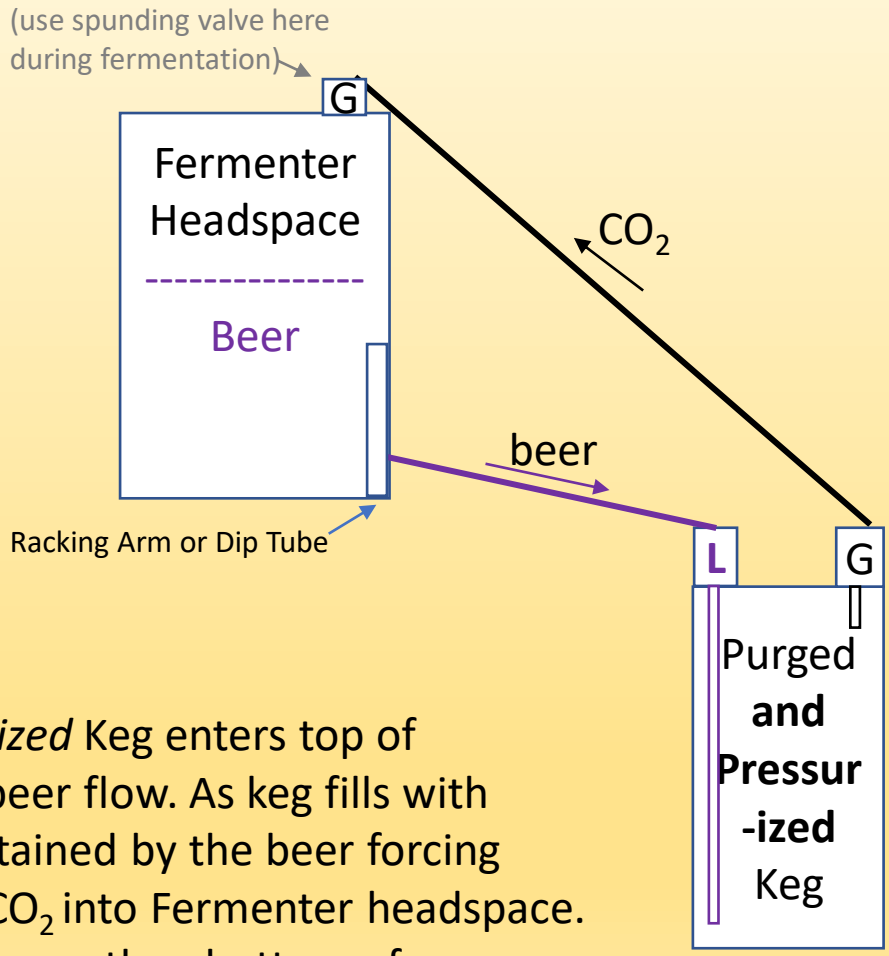
Traditional Airlocks allow O_2 into the fermenter once fermentation slows down.

Generic Closed Transfer Chain



CO_2 from tank enters fermenter headspace and starts beer flow to keg. As keg fills with beer, keg headspace gases start to flow out of spunding valve…"one way only" gas flow. Recommend using low CO_2 tank pressure (~4-5 PSI), to help avoid spraying beer up into the spunding valve at end of xfer. Setting spunding valve at a low (1-2 PSI) setting helps keep transfer speed from getting *too* slow. *As soon as beer line shows any CO_2 space (i.e. is at end of beer), turn off CO2 and disconnect beer line from keg. You don't want CO2 spraying into keg.*

Transfer Chain Alternative: Pressure/Gravity Loop



Pressure from *pressurized* Keg enters top of fermenter and starts beer flow. As keg fills with beer, Pressure is maintained by the beer forcing more keg headspace CO_2 into Fermenter headspace. Top of keg should be lower than bottom of fermenter.

Fermenter Example 1

Spunding Valve for fermentation. Move to keg and replace with CO2 source for closed transfer.

Gas Corny Post (for fermentation spunding valve and for CO2 during transfer)

(Thermowell outer housing and "blowoff" assembly. CO2 Conduit)

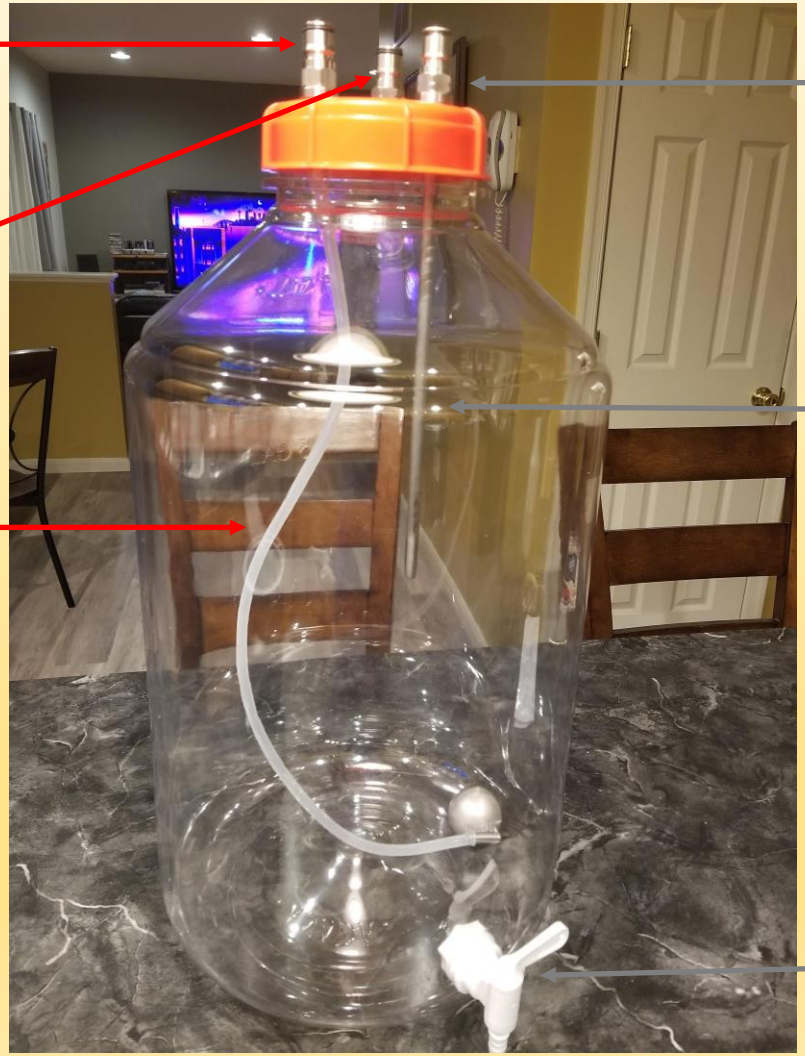
Sample/Racking Arm Valve (for closed xfer of beer)

Fermenter Example 2

Liquid Corny Post/Bulkhead (for racking)

Gas Corny Post/Bulkhead (for fermentation spunding valve and for CO2 during transfer)

Floating Dip Tube



(corny post without poppet (holds thermowell))

(thermowell)

(Sample valve. Could be used for racking if there were no floating dip tube)

What About Dry Hopping?

- A Hop Dropper can be used in between a conical fermenter and a gas post on the Dropper
- Dropper's butterfly valve (i.e. valve between dropper and fermenter) *remains open during fermentation*, with a spunding valve on Dropper's gas post (in lieu of airlock)
- To Dry Hop, remove spunding valve, close the butterfly valve, load hops into Dropper, purge, and Re-Open butterfly to Drop
- *Reinstall spunding valve*

Hop Dropper

Corny Gas Post for Spunding Valve during fermentation and for CO2 from Tank during Hop Purge and during Closed Transfer

Pull type Pressure Relief Valve for Hop Purge cycles

Sight Glass (Hop Reservoir)

Butterfly Valve Handle… open (up) during fermentation and during closed xfer, closed *only* for hop load/purge.

Tri-Clamp, NPT, and Corny Connections. Attaches to top of Fermenter via 3” Tri-Clamp.

Butterfly Valve