



ENGINEERING CLARIFICATION

EC TITLE: Variable Frequency Drives - Constant Torque Clarification

PROJECT: 3 Kings Water Treatment Plant

EC NO.: 79

DATE: 11/4/2020

STATUS: Open

SECTION 1: BY CONTRACTOR

QUESTION:

Based on discussions with the rotary lobe pump vendor as well as the positive displacement blower vendor some VFDs need to be constant torque instead of variable torque.

DRAWING NO.:

SPECIFICATION SECTION: 26 29 23 Low-Voltage Adjustable Frequency Drive System

POTENTIAL COST IMPACT:

POTENTIAL SCHEDULE IMPACT:

PROPOSED SOLUTION:

1. The following VFDs shall be provided as constant torque, with current ratings coordinated with motor needs. See attached motor data sheet for rotary lobe pumps for corresponding HP ratings. The VFDs already need altitude deration for 6800 ft site elevation. Note motor datasheet for blowers is not available yet:
 1. VFD-200-103-01 (for PMP-200-103-01) - 60HP
 2. VFD-200-104-02 (for PMP-200-104-02) - 60HP
 3. VFD-200-401-01 (for PMP-200-401-01) - 7.5HP
 4. VFD-200-402-02 (for PMP-200-402-02) - 7.5HP
 5. VFD-200-403-03 (for PMP-200-403-03) - 7.5HP
 6. VFD-300-101-01 (for BLWR-300-101-01) - 40HP
 7. VFD-300-102-02 (for BLWR-300-102-02) - 40HP
 8. VFD-310-128-01 (for PMP-310-128-01) - 3HP
 9. VFD-310-130-02 (for PMP-310-130-02) - 3HP
 10. VFD-310-120-01 (for PMP-310-120-01) - 15HP
 11. VFD-310-122-02 (for PMP-310-122-02) - 15HP
 12. VFD-500-102-02 (for PMP-500-102-02) - 5HP
 13. VFD-500-103-02 (for PMP-500-103-02) - 5HP
2. Please note that this will also affect MCC-200-01, MCC-340-01, and MCC-500-01.
3. Update the VFDs included in the clarification to constant torque and update MCCs.

COMMENTS:

INITIATOR: Manika Gupta

PRIORITY: Normal

REQUESTED RESPONSE DATE: 11/18/2020

SECTION 2: BY REVIEWER

RESPONSE:



ENGINEERING CLARIFICATION

COMMENTS:

REVIEWED BY:

REVIEWED DATE:

HIGH PERFORMANCE MOTOR RATINGS

Motor Type	P _n Full Load Power		n _n Full-Load Speed	I _n Full-Load Current			I _l /I _n Locked Rotor Current Ratio	NEMA Code Letter	T _n Full-Load Torque	T _l /T _n Locked Rotor Torque Ratio	T _b /T _n Break Down Torque Ratio	pf Power Factor	η Full Load Efficiency	J _m Rotor Inertia	Duty Cycle
	[hp]	[kW]		[rpm]	230V [A]	460V [A]									
High Performance Motors															
63 S/4	0.16	0.12	1700	0.88	0.44	0.37	250%	F	5.93	2.7	3.5	0.66	52.0%	0.0050	S1 cont
63 L/4	0.25	0.18	1680	1.12	0.56	0.46	270%	E	9.38	2.3	2.5	0.71	57.0%	0.0066	S1 cont.
71 S/4	0.33	0.25	1710	1.56	0.78	0.66	310%	G	12.2	2.4	2.7	0.64	63.0%	0.017	S1 cont.
80 L/4	1	0.75	1650	3.66	1.83	1.46	390%	G	38.2	2.2	2.3	0.74	70.0%	0.034	60 min
90 S/4	1.5	1.1	1660	4.84	2.42	1.94	490%	G	57.0	2.5	2.8	0.78	73.0%	0.056	60 min
90 L/4	2	1.5	1660	6.34	3.17	2.54	510%	H	75.9	2.5	2.8	0.80	74.0%	0.074	60 min
100 L/4	3	2.2	1705	9.00	4.50	3.63	490%	G	111	2.3	2.6	0.81	76.0%	0.107	60 min
100 LA/4	5	3.7	1725	15.2	7.60	6.10	510%	G	183	2.7	3.1	0.75	81.0%	0.142	60 min
132 S/4	7.5	5.5	1735	19.8	9.90	7.92	540%	G	272	2.4	2.7	0.82	85.0%	0.570	60 min
132 M/4	10	7.5	1735	25.8	12.9	10.3	630%	H	363	2.9	3.2	0.84	87.0%	0.759	60 min
160 M/4	15	11	1770	35.8	17.9	14.5	820%	J	534	2.9	3.8	0.85	90.7%	1.19	60 min
160 L/4	20	15	1760	48.4	24.2	19.3	850%	K	716	2.9	3.9	0.87	89.4%	1.59	60 min
180 MX/4	25	18.5	1760	59.0	29.5	23.6	880%	K	895	3.4	4.3	0.87	90.5%	1.90	60 min
180 LX/4	30	22	1765	74.4	37.2	29.8	890%	K	1071	3.6	4.4	0.80	92.8%	2.18	60 min
200 LX/4	40	30	1770	98.6	49.3	39.4	690%	H	1424	3.2	3.6	0.83	92.1%	3.80	60 min
Premium Efficient Motors															
80 LP/4	1	0.75	1730	3.14	1.57	1.26	650	K	36.4	3.5	3.8	0.70	86.1	0.045	S1 cont.
90 SP/4	1.5	1.1	1740	4.20	2.10	1.68	840	L	54.3	4.2	4.9	0.76	86.9	0.081	S1 cont.
90 LP/4	2	1.5	1730	5.60	2.80	2.24	760	K	72.9	3.9	4.3	0.78	87.0	0.093	S1 cont.
100 LP/4	3	2.2	1770	7.68	3.84	3.07	920	L	107	3.0	4.5	0.79	90.0	0.192	S1 cont.
112 MP/4	5	3.7	1755	13.0	6.50	5.20	950	L	180	4.1	4.6	0.80	90.3	0.332	S1 cont.
132 SP/4	7.5	5.5	1770	19.5	9.75	7.80	1020	M	267	4.7	5.0	0.77	91.7	0.759	S1 cont.
132 MP/4	10	7.5	1765	26.7	13.4	10.7	960	M	357	4.7	5.0	0.77	91.7	0.831	S1 cont.
160 MP/4	15	11	1770	35.6	17.8	14.2	880	K	534	3.2	3.8	0.84	92.5	1.59	S1 cont.
160 LP/4	20	15	1775	47.6	23.8	19.0	1080	M	710	4.3	4.7	0.85	93.0	2.18	S1 cont.
180 MP/4	25	18.5	1780	60.6	30.3	24.2	1010	L	885	3.9	4.0	0.82	93.6	3.80	S1 cont.
180 LP/4	30	22	1780	69.6	34.8	27.8	880	K	1062	3.3	3.4	0.85	93.6	3.80	S1 cont.
225 RP/4	40	30	1785	-	49.5	39.6	890%	K	1420	3.4	3.8	0.81	94.5%	11.63	S1 cont.
225 SP/4	50	37	1785	-	59.7	47.8	880%	K	1752	3.0	3.7	0.82	94.6%	12.81	S1 cont.
225 MP/4	60	45	1785	-	72.0	57.6	910%	K	2131	3.3	3.6	0.83	95.2%	15.90	S1 cont.
250 WP/4	75	55	1785	-	84.4	67.5	920%	J	2604	2.9	3.2	0.86	95.4%	19.46	S1 cont.

With energy gearing, inverter-duty motors, and AC variable frequency drives, NORD provides an intelligent energy saving product portfolio. NORD can be your partner in selecting motors to match each application for ideal performance and maximum energy savings. In keeping with this concept, NORD offers a variety of high performance motors including:

- NORD **continuous duty, premium efficient motors (1–75 HP)** satisfy global energy mandates, NORD's premium motors provide maximum energy savings, offer low rotor inertia, provide quick starts & stops, & handle high cycle rates in dynamic applications.
- NORD **60 minute duty motors (1 - 40 HP)** motors are labeled "60 MIN" duty & are perfectly suited for intermittent or time limited applications. These motors offer higher cycling capacity, lower motor rotor inertia, & lower energy consumption while starting or stopping, as compared to the NORD isfy other periodic duty or intermittent duty ratings.
- NORD **continuous duty, standard efficient motors (0.16 – 0.75 HP)** satisfy global energy mandates. They are exempt from the June 1, 2016 mandate requiring NEMA Premium Levels (D.O.E. 10 CFR Part 431). Like 60 minute duty motors, these motors offer higher cycling capacity, lower motor rotor inertia, and lower energy consumption while otors.

Effective June 1, 2016, most general purpose, 1- 500 Hp, continuous duty motors sold in the U.S., must meet NEMA Premium Levels (D.O.E. 10 CFR Part 431). Intermittent-rated motors (60 Min. Duty) and fractional horsepower/totally-enclosed motors are exempt from this latest U.S. mandate; properly applied, these motors often lead to less energy consumption, especially during starts and stops.