TOWN OF WATERTOWN

REQUEST FOR PROPOSAL

Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal

The Town of Watertown requests proposals for the Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal. Only proposals from experienced and reputable contractors will be considered. Request for Proposal documents are available at the Town Hall Annex, 424 Main Street, Watertown, Connecticut 06795, Telephone (860) 945-5260, Monday through Friday, 8:30 am to 4:30 pm or by accessing the Town’s website at www.watertownct.org.

Sealed proposals must be submitted no later than March 9th, 2017 at 11:00 am.

Mandatory Pre-Bid Meeting Date: February 16, 2017, 9:00 AM at the pump station which is located on Winding Brook Farm Road, in front of house #224, the nearest intersecting street is Platt Road.

The Town of Watertown reserves the right to award in part, to reject any and all proposals in whole or in part, or to waive technical defects, irregularities and omissions, if in its judgment the best interests of the Town will be served.

Jason Warner
Purchasing Agent
Town of Watertown
424 Main Street
Watertown, CT 06795
TOWN OF WATERTOWN

REQUEST FOR PROPOSAL

Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal

I. GENERAL INFORMATION

A. Proposal Format

1. All responses to this RFP must conform to these instructions. Failure to conform may be considered appropriate cause for rejection of responses.

2. Delivery of Responses - RFP responses must be in sealed envelopes upon which a clear indication has been made of the RFP reference title, as well as the date and time the bid is due. Names and addresses of vendors must appear on the envelopes.

3. Structure of Responses – Respondents must structure responses as outlined in this Request for Proposals. Proposals will be submitted on Respondent’s stationery, clearing describing the proposed design work and prices.

4. Inclusion of Taxes in Prices - The Town of Watertown is exempt from payment of excise, transportation, and sales taxes imposed by the Federal Government and/or the State. Such taxes must not be included in prices.

B. Proposal Contents

Proposals must put forth full, accurate and complete but concise information as required by this request. The proposal should:

1. Describe how each element of the work described in this RFP will be dealt with.

2. Describe the work currently under contract and respondent’s ability to meet time schedules proposed.

3. Describe how project will be scheduled.

4. Describe respondent’s expertise and prior relevant experience in the nature of work requested.
C. Submission of Proposals
All proposals and literature shall be submitted IN DUPLICATE on the proposal form, which is a part of these specifications.

Descriptive literature containing complete specifications must accompany each bid. If a bidder wishes to furnish additional information, more sheets may be added.

Adobe Acrobat® Reader is required to view electronic documents on-line. If you do not have Adobe Acrobat® Reader, you may download it for free from Adobe at http://www.adobe.com/products/acrobat/readstep.html.

Response summaries will be available online at http://www.watertownct.org on the day of the bid opening.

Responses delivered via fax are received subject to the following qualifications and limitations:

The Town is not responsible for the confidentiality of the information transmitted.

The Town cannot guarantee that its fax equipment will be operational and able to receive transmittals by a particular time and date. It is the Bidder's responsibility to ensure that quotations are received in their entirety and on time at the required location. It is recommended that vendors be advised to call immediately after transmitting a document electronically to confirm complete and accurate receipt by the Town. The Town assumes no liability in the event that a bidder's electronic transmission is not received by the Town in a timely fashion, or is not received either in its entirety or error-free.

Bids transmitted electronically which have a bond requirement are subject to the same submittal requirements as those responses delivered via traditional means, such as mail or hand delivery, or as otherwise stipulated by appropriate authority.

D. Acceptance Period
In submitting the proposal, respondent agrees that the proposal will remain valid for a period of ninety (90) days after the closing date for submission of proposals and may be extended beyond that time by mutual agreement.

E. Project Oversight/Coordination
The Town of Watertown will be responsible for overall project supervision and coordination of all technical aspects of the project.
F. **Statement of Purpose**
The purpose of the proposal is to select a respondent to incorporate a #2 PLC & VFD Control System Specifications for the Winding Brook Sewer Pump Station Request for Proposal for the Town of Watertown.

G. **Time Period**
For purposes of this project, work must start within thirty (30) days of written authorization from the Town.

H. **Periodic Briefings**
The successful respondent will present periodic briefings on the progress of the project to the Town of Watertown at such times as the Town shall determine necessary, and as outlined more specifically in Section IV.

I. **Deadline for Proposals**
Two (2) copies of the proposal must be submitted to the Purchasing Agent, Town Hall Annex, 424 Main Street, Watertown, Connecticut 06795 (860) 945-5255. Sealed proposals must be submitted no later than March 9th, 2017 at 11:00am.

J. **Addenda And Interpretations & Alternate Proposals**
In the event it becomes necessary to revise any part of this Request for Proposals, addenda will be provided to all prospective firms submitting proposals.

Addenda information will be available online at http://www.watertownct.org. Adobe Acrobat® Reader may be required to view this document. We strongly suggest that you check for any addenda a minimum of forty eight hours in advance of the bid deadline.

At the time of the opening of bids each bidder will be presumed to have inspected the work and to have read and to be thoroughly familiar with all of the Contract Documents (including all addenda). The failure or omission of any bidder to receive or examine any form, instruction or document shall in no way relieve any bidder from any obligation in respect to his bid.

If any person contemplating submitting a proposal is in doubt as to the true meaning of any part of these specifications, he may submit a written request for an interpretation to the Purchasing Agent. No interpretations as to the meaning of the plans, specifications or other Contract Documents will be made to any bidder orally.

Every request for such interpretation should be emailed to the Town of Watertown, Purchasing Agent at warner@watertownct.org. To be given consideration, request must be received at least five (5) days prior to the date fixed for the opening of Bids.
Any and all such interpretations and any supplementary instructions will be in the form of written Addenda to the Specifications which, if issued, will be posted on the Town’s website, no later than three (3) days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such Addendum or interpretations shall not relieve any bidder from any obligations under his bid as submitted. All Addenda so issued shall become part of the Contract Documents. Oral explanations will not be binding on the Town.

The specifications listed are to be interpreted as meaning the minimum acceptable by the Town of Watertown. Bidders are requested to submit quotations on the basis of these specifications. Alternative bids providing a broader scope and/or services than requested in these specifications may receive consideration providing such equipment and/or service is clearly explained. Any exceptions to the specifications requested herein must be clearly noted in writing and are to be included as a part of your bid proposal. If none are included it will be assumed that there are none.

Definition of the word "complete" means that each unit of the equipment proposed shall include all appurtenances, fasteners, parts, accessories, and services ordinarily catalogued.

An item equal to that named or described in the specifications may be furnished by the Bidder, except where expressly noted as “no substitutions.” The naming of any commercial name, trademark, or other identification shall not be construed to exclude any item of any manufacturer not mentioned by name, nor limit competition, but shall establish a standard of equality only. An item shall be considered equal to the item so named or described if:

- It is at least equal in quality, durability, appearance, strength and design.
- It will perform at least equally the function imposed by the design for the work being contracted for or the material being purchased.
- It conforms substantially, even with deviations, to the detailed requirements for the item in the specifications.

The Bidder shall hold the Town of Watertown, its officers, agents, servants, and employees, harmless from liability of any nature or kind because of use of any copyrighted or non-copyrighted compositions, secret process, patented or unpatented inventions, articles or appliances furnished or used under this bid, and agrees to defend, at his own expense, any and all actions brought against the Town of Watertown or himself because of the unauthorized use of such articles.

K. Incurring Costs
The Town of Watertown is not liable for any cost incurred by any respondent prior to
the issuance of a contract and purchase order.

II. CONDITIONS

Respondents must be willing to adhere to the following conditions and must positively state them in their Proposals:

A. **Ownership of Proposals**
   All proposals in response to this RFP are to be the sole property of the Town of Watertown and subject to the provisions of Section 1-19 of the Connecticut General Statutes (Re: Freedom of Information).

B. **Timing and Sequence**
   Timing and sequence of events resulting from this Request for Proposals will ultimately be determined by the Town.

C. **Oral Agreements**
   Any alleged oral agreement or arrangement made by a respondent with the Town or any employee will be superseded by the written agreement.

D. **Amending or Canceling Request**
   The Town reserves the right to amend or cancel this Request for Proposals prior to the due date and time, if it is determined to be in the best interest of the Town and State.

E. **Rejection for Default or Misrepresentation**
   The Town reserves the right to reject the proposal of any respondent which is in default of any prior contract or for misrepresentation.

F. **Town’s Clerical Errors in Awards**
   The Town reserves the right to correct inaccurate awards resulting from its clerical errors.

G. **Rejection of Qualified Proposals**
   Proposals are subject to rejection in whole or in part if they limit or modify any of the terms, conditions, and/or specifications of this Request for Proposals.

H. **Presentation of Supporting Evidence**
   A respondent, if requested, must be prepared to present evidence of experience, ability, service facilities, and financial standing necessary to meet satisfactorily the requirements set forth or implied in the proposal.
I. **Changes to Proposal**  
No additions or changes to the original proposal will be allowed after submittal. While changes are not permitted, clarification at the request of the Town may be required at the respondent's expense.

J. **Collusion**  
By responding, a respondent implicitly states that his proposal is not made in connection with any competing vendor submitting a separate response to the RFP, and is in all respects fair and without collusion or fraud. It is further implied that the respondent did not participate in the RFP development process and had no knowledge of the specific contents of the RFP prior to its issuance, and that no employee of the agency participated directly or indirectly in the respondent's proposal preparation.

III. **PROPOSED PROJECT**

The project is for the Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal.

IV. **SCOPE OF WORK**

A. **General Requirements**  
It shall be the responsibility of the successful respondent to obtain the appropriate building permits for the proposed work. Local permit costs will not be waived.

All materials and labor shall be unconditionally warranted for a period of two (2) years from the date of acceptance.

B. **Technical Specifications. (See page 13)**

V. **GENERAL PROVISIONS**

A. **Expertise Desired**  
In order to provide the required services to the Town the respondent must possess expertise in the field addressed in this Request for Proposals. Proposals must address the respondent's abilities and relevant prior experience in the area(s) of service offered and include a list of prior clients for whom the respondent has carried out
comparable work programs with names, addresses and telephone numbers of contact persons.

B. **Selection**  
The Town reserves the right, at its sole option, to make the selection of the firm, or to reject any and all firms.

C. **Revisions and/or Additional Provisions**  
The Town reserves the right to revise any article or clause of the Request for Proposals, or to add or delete any article or clause, prior to the award of the contract.

D. **Modification of Contract**  
The Town reserves the right to amend, extend, curtail or otherwise change the terms of any resultant contract(s) prior to execution, upon determination that such action is to be to the advantage of the project effort.

E. **Compliance with Federal and State Laws**  
The successful respondent shall be required to comply with all applicable Federal and State laws, rules and regulations, and will not discriminate or permit discrimination against any person or group of persons on the grounds of sex, race, color, age or national origin in any manner prohibited by law.

F. **Covenant Against Contingent Fees**  
The successful respondent shall be required to warrant that he has not employed or retained any company or person other than a bona fide employee working for the respondent to solicit or secure an agreement hereunder and that he has not paid or agreed to pay any company or person other than a bona fide employee any fee, commission, percentage, brokerage fee, gift or any other consideration contingent upon or resulting from an award under this Request for Proposals and any resultant contract.

G. **Authority to Bind Respondent**  
The proposal must be signed by an authorized official. The respondent's proposal is to identify the individual(s) having authority to negotiate and contractually bind the respondent. It is also to name the person to be contacted both during the period of evaluation of proposals and for prompt contract administration upon award of the contract. This information is to include name, title, address and telephone.

H. **Authority to Obligate the Town of Watertown**  
The Purchasing Agent/Town Manager of the Watertown is the only individual who may legally commit the Town to the obligation of any contract(s) contemplated herein. No cost chargeable to the proposed contract(s) may be incurred before receipt of either a fully executed contract or a specified written authorization from the Town.
I. **Contract**  
The successful respondent shall enter into a written contract agreement with the Town of Watertown within ten (10) days after notice of award.

J. **Insurance**  
1. **General:**  
The respondent shall be responsible for maintaining insurance coverage in force for the life of the contract of the kinds and adequate amounts to secure all of the respondent’s obligations under the contract with an insurance company with an AM Best Rating of A - VII or better licensed to write such insurance in Connecticut and acceptable to the Town of Watertown.

   The insurer shall provide the Town of Watertown with Certificates of Insurance signed by an authorized representative of the insurance company(ies) prior to the performance of this contract describing the coverage and providing that the insurer shall give the Town of Watertown written notice at least thirty (30) days in advance of any termination, expiration, or any and all change in coverage.

   Such insurance or renewals or replacements thereof shall remain in force during the respondent’s responsibility under this agreement.

   The respondent at the respondent’s own cost and expense, shall procure and maintain all insurance required and shall name the Town of Watertown as an additional insured on all contracts except Worker’s Compensation and Professional Errors & Omissions coverages.

   In order to facilitate this requirement for insurance, it is recommended that the respondent forward a copy of this exhibit to the respondent’s insurance representative(s).

2. **Specific Requirements:**  
a. **Workers’ Compensation Insurance,**  
The respondent shall provide Workers’ Compensation Insurance required by law and the Employer’s Liability Insurance for at least the amounts of liability for Bodily Injury by accident of $100,000 each accident; Bodily Injury by Disease each employee of $100,000; Bodily Injury by Disease, policy limit of $500,000.
b. **Commercial General Liability Insurance.**
The respondent shall carry Commercial General Liability policy (Insurance Services Office Incorporated Form CG-0001 or equivalent). A per occurrence limit of $1,000,000 is required. The Aggregate Limit will be not less than $1,000,000.

c. **Business Automobile Liability Insurance.**
The respondent shall carry Business Automobile Liability Insurance. (Insurance Services Office Incorporated Form CA-00001 or equivalent). A per occurrence limit of $1,000,000 is required. “Any Auto” (symbol 1 or equivalent) is required.

3. **Hold Harmless & Subcontractor’s Requirements:**
The respondent shall require the same insurance that it is required to carry by the Town of Watertown to be carried by any subcontractors and independent contractors hired by the respondent and to obtain Certificates of Insurance before subcontractors and independent contractors are permitted to begin work.

The respondent shall require that the Town of Watertown be named as Additional Insured on all subcontractor’s and independent contractor’s policies before they are permitted to begin work.

The respondent and all subcontractors and independent contractors and their insurers shall waive all rights of subrogation against the Town of Watertown, and its officers, agents, servants and employees for losses arising from the work performed by each on this contract.

The respondent assumes and agrees to hold harmless, indemnify, protect and defend the Town of Watertown against any and all liability for injuries and damages to Bidder and to Bidder’s employees, agents, subcontractors and guests, third parties or otherwise incident to or resulting from any and all operations performed by a contractor under any terms of this contract.

4. **Other Data:**
**NOTE 1:** If respondent is only a vendor shipping goods via Common Carrier only, General Liability is required.

**NOTE 2:** If respondent is a Professional, Errors & Omission coverage will be required.

**NOTE 3:** The Town reserves the right to amend amounts of coverage required and the types of coverage’s provided based on work or service to be performed.
K. **Subcontracting**
Each respondent contemplating the use of any subcontractor shall submit a list of subcontractors on their proposal.

The successful respondent shall file with the Town of Watertown, within five (5) days after the opening of the Request for Proposals, a complete list of the names and addresses of competent, responsible and qualified subcontractors who are actually to perform major portions of the work. This in no way restricts or limits the requirement that all subcontractors must be approved by the Town.

Subcontractors listed on the proposal or those previously approved may not be changed without the approval of the Town of Watertown.

Local subcontractors, material suppliers, and labor in the Town of Watertown should be considered and sought insofar as is practical in the performance of this project.

VI. **CRITERIA FOR EVALUATING PROPOSALS**

Proposals will be evaluated by the Town based on the following criteria:

- Respondent’s background and professional expertise, including previous experience, special qualifications, and personnel.

- Respondent’s availability and flexibility to commit staff in a timely way when requested, and to complete this project within the shortest reasonable time frame. Since time is of the essence, the respondent should provide detailed timing sequences corresponding to the proposed scope of work proposed.

- Demonstrated understanding of the task. Evidence of any special or innovative approach which the firm will utilize in conducting its design. The Town wishes to encourage a creative approach to the work which will result in a cost effective project.

- Time and cost of the proposal.

- Such other factors as the Town deems important.
VII. PROJECT SCHEDULE

Submission of detailed proposals:

Selection of successful respondent and Notice to Proceed:

Completion date:

The Town reserves the right to reject any and all proposals and to require any and all respondents to appear before the Committee to present their proposals orally and to entertain questions. The Town further reserves the right to negotiate with the selected form as to the scope and cost of the project.

Further information may be obtained from the Purchasing Agent's Office, Town Hall Annex, 424 Main Street, Watertown, Connecticut 06795 (860) 945-5255, Monday through Friday, 8:30 a.m. until 4:30 p.m.

Equal Opportunity Employer/Affirmative Action
Town of Watertown, CT

Water & Sewer Authority
747 French Street
Oakville, CT 06779

Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal.

The Town of Watertown, CT Water & Sewer Authority is currently seeking detailed technical proposals for the design, implementation, startup and commissioning of an Allen Bradley PLC-based control system. This system will replace existing float based controls at the Winding Brook Sewer Pump Station #2. The scope of work, for this RFP, includes designing, providing and installing new control panels, removal of existing panel and unused wiring, and coordinating with the SCADA Systems Integrator, Electrical and pump installers and to provide a complete and functioning control system. The existing pumps are 5 HP, single phase 230Vac rated. Measured voltage on-site is 243Vac. The new pumps, two (2) Tsurumi model 80C23.7-CR, 5Hp, will be three phase 230Vac “cutter pumps”. The primary purpose of the VFD’s is to provide single to three phase conversion. No speed control is required. The existing Generator shall be wired to power the pumps in the event of a power failure. The Generator provides 240Vac single phase.

Two control panels will be required. One to replace the existing motor starter panel with a new 30”Hx30”Wx10”D NEMA 12 painted steel enclosure with white steel back panel. This enclosure will house the two VFD’s, Electrical distribution and connections to pumps, Circuit Breakers, Disconnect switch, fuses, user terminal blocks to interface all control and monitoring connections, and UPS unit for Allen Bradley PLC control panel. The second panel will house the new Allen Bradley PLC controls, Radio Unit (provided by others), Touchscreen Display, circuit breaker, power supplies, fuses and user terminal blocks, Instrumentation and float connections and be approximately 20”Hx20”Wx8”D NEMA 12 painted steel enclosure with white steel back panel. Final sizing and installation will be the responsibility of the successful bidder.

All PLC programming, Radio Network Integration, Radio antenna and cabling, SCADA System programming and configuration, Pumps, Pump wiring, Submersible Pressure Transducer, and Floats will be provided by others. The new panels shall be SCADA and Ethernet ready.

The scope of Design/Engineering Support Services Work included under this RFP shall contain all design submittals, AutoCAD Submittal and final as-built drawings, equipment data sheets for all provided system components. See ‘Appendix A’ for basic dimensional building wall available space, pump specifications, motor plate information, existing panel locations and other design conditions/requirements. Also, included is the In-panel termination of all instrumentation, control devices, power and pump wiring from all sources external to control panels, field startup and calibrations, control system checkout and commissioning, and on-site startup and training for the Owner’s support personnel. The pump station will be taken out of service for
approximately 6-8 hrs., during which time the existing grinder pumps, rails, base elbow, floats and wiring will be removed and replaced with the new pumps, rails, base elbow, floats(2) and pressure transducer. Also, the existing control panel will be removed and replaced with the new control panels and wiring. All power wiring from the main breaker to the control panels and generator shall be upgraded as required. Also, all circuit breakers shall be upgraded as needed.

Response to RFP:

All bidders shall provide, as part of their bid package, the following items:

1. A complete set of equipment data sheets and technical specifications for all equipment and components being provided to comply with the specifications.
2. Complete Bill of Materials equipment list including Manufacturer, full part number, quantity and brief description for all equipment and components provided.
3. Detailed submittal drawings and Wiring Schematics. Panel layout drawing specific for the project.
4. Provide supporting documentation, including any calculations or manufacturers recommendations, to support VFD selection.
5. Price shall be provided as a lump sum bid and include all parts, labor, Travel expenses, 1-year warranty requirements, spare parts, startup and training as required by these specifications to provide a complete and functioning control system.

Bidders Qualifications:

To be considered for award, all bidders shall have successfully completed at least five (5) similar projects in both size and scope. The Owner may request references. In addition, the successful bidder must be able to provide 24 hour/7 days a week telephone support. On-Site response to Warranty & other Emergency requirements shall be within 24 hours. Bidders support facilities must be located within 150 miles of the jobsite. During the 1-year warranty period all labor and travel expenses are the responsibility of the successful bidder.

PLC Control Panel:

The successful bidder is responsible for coordinating, designing and providing and installing a complete and functioning PLC control panel. The control panel shall be provided, constructed, labeled and serialized UL508A in-house by the successful bidder. The PLC control panel minimum requirements are listed below as a guide:

- Approximate 20"Hx20"Wx8"D wall mounted NEMA12 painted steel panel. White painted steel back panel. Actual size will be determined during design process.
- Allen Bradley Micrologix 1100 PLC part number 1763-L16BBB and 1762-IF4 Analog Input card. Due to the existing SCADA system components no substitutions will be allowed.
- 24VDC 5amp power supply minimum.
• 15amp circuit breaker for 120VAC single phase input.
• New 230Vac circuit breakers for each VFD line input.
• New wiring to each pump, control panel and VFD circuits will be provided by others.
• Independent Fuse disconnects for PLC and Radio. Design must provide room to mount GE MDS SD1 radio (provided by others).
• 24VDC Interposing relays for pump start contacts.
• DIN mounted 120Vac duplex outlet.
• Two (2) 22mm HOA switches, two (2) of each Red (Stop) and Green (Run) 22mm LED lights for both pumps. May be mounted either on PLC or VFD control panel. Each HOA switch will have two (2) N.O and two (2) N.C contacts each. All HOA switches and lights shall be terminated on the provided user terminal strip for connection by others. Lights and switches will operate from 24Vdc.
• Provisions for connecting the following but not limited to PLC Digital Inputs for two (2) control floats, VFD failure contacts, Pump Motor faults such as temperature and leak detection if available. PLC Digital Outputs for two (2) VFD start/stop. PLC Analog Inputs for one (1) level pressure transmitter (provided by others).
• Provide and install 7" Maple Systems Color Touchscreen display part number HMI5070NL ver2 with Ethernet and serial communications. No substitutions will be allowed. Unit may be mounted on front of VFD control panel.

VFD Control Panel:

The successful bidder is responsible for coordinating, designing and providing a complete and functioning VFD control panel. The control panel shall be provided and constructed in-house by the successful bidder.

The VFD control panel minimum requirements are listed below as a guide:

• Approximate 30"Hx30"Wx10"D wall mounted NEMA12 painted steel panel. White painted steel back panel. Actual size will be determined during design process.
• Two (2) Schneider Electric ATV312 7.5hp VFD’s (Recommended by pump Manufacturer). VFD must convert 230VAC 60hz single phase to 230VAC 3-phase sufficient for each cutter pump. It is important to remember that the main purpose of the VFD’s is to provide single phase 230Vac conversion to three phase 230Vac with sufficient current capability to start and run the Tsurumi cutter pumps. Consult Tsurumi TOS80C23.7 pump specifications. If an alternate VFD is provided the successful bidder shall be responsible for any damage to both the VFD’s and Tsurumi Grinder Pumps.
• Front enclosure door main disconnect switch.
• 30 amp 230VAC single phase Circuit breaker for each VFD input.
• User terminal blocks for connection of VFD control and monitoring low voltage signals.
• See ‘Appendix B’ for special pump Manufacturer’s VFD requirements.
**Uninterruptible Power Supply:**

- The successful bidder shall provide and install, in VFD enclosure, a 700VA minimum UPS such as the APC Back-UPS Pro BR700G. Unit shall power PLC, Radio, level pressure transmitter and Touchscreen display during power outages.

**Spare Parts:**

The successful bidder shall provide:

- Three (3) of each type fuse used in either control panel.
- One (1) of each type interposing relay used.

**Pump Station Operation:**

The main purpose of the control system is to operate on the level provided by the level transmitter in the wet well.

Two backup floats shall also be provided, one will be set at a high level and one at a low level. When activated, the high level float will turn the pump(s) “ON” and set off a high level alarm and the low level float will turn the pump(s) “OFF” and set off a low level alarm.

The (2) backup floats will be able to run the pumps at all times, regardless of the status of the level transmitter.

**Project Closeout/Completion:**

All work performed shall be furnished & completed in a neat and professional manner. Project completion is required within 120 days of receipt of letter to proceed. As part of the closeout documents, the successful bidder shall provide two (2) hard and two (2) digital (CD or DVD) copies of an Operations and Maintenance Manual. Each shall contain a full set of as-built AutoCAD line and schematic drawings of both control panels as well as show all external connections to all controlled and monitored devices. List of VFD configuration parameters, Manufacturer’s maintenance/user manuals, Bill of Materials including part numbers and calibration data if applicable. All unused equipment and wiring shall be removed from the site.

**Warranty:**

All labor, travel expenses and Equipment shall be warranted for a period of 1-year after the date of acceptance, by the owner, against Manufacturer’s defects.
Training:

- One (1) 4-hour training session covering all aspects of the provided and installed equipment.
- One (1) 4-hour training session covering all maintenance aspects of the control system.
- Within 1-year of operation the Owner may request one (1) additional 4-hour training session to cover any topic deemed necessary by the Owner.

Alarms and Other Requirements

The following alarms shall be provided:

Pump 1 Run Status
Pump 1 Fail
Pump 1 Fail to pump (based on level not dropping)
Pump 2 Run Status
Pump 2 Fail
Pump 2 Fail to pump (based on level not dropping)
High Level (based on pressure transducer)
Low Level (based on pressure transducer)
High Float Level (turns lead pump “on”)
Low Float Level (turns pump “off”)
Generator Run
Generator Common Alarm (fail to start)
Loss of station power

Provide (2) elapsed time meters
Provide an event log, minimum 7 days of data
Provide Flow Monitoring (GPM)
Provide Current Monitoring

Motor Plate Data

Tsurumi Pump Submersible Pump Thermally Protected
No. B-10963655 Man. Y/M 169 Conforms to UL Std. 778 Cert. to CAN/CSA Std. C22.2 No. 108

Model 80C23.7-CR -61
Bore 3 inch Hertz 60 Phase 3
Head Max. 90 FT.
Flow Max. 264 GPM
Volt 208/230 AMP. 14.4/13.6 Pole 2, Ins. F
Output 5 HP
Appendix
Rugged, Powerful TSURUMI Pumps for Perfect Sewage & Waste Water Control
Tungsten Carbide Edged Impeller Shreds Solids, Making Pumps Efficient Sewage Ejectors

TSURUMI C-series submersible pumps with a tungsten carbide edged impeller are ideal for pumping sewage, waste water, and digested solids containing long fibers materials at pumping stations and sewage treatment plants. The pumps are also used at many construction sites for continuous drainage. The C-series pumps have the same high-quality construction as the B-series. See our B-series catalogue for typical installation.
### Tsurumi Pump

**C - SERIES**

**CUTTER-TYPE SEWAGE & WASTEWATER PUMPS**

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<th>DORE</th>
<th>HP</th>
<th>KW</th>
<th>RPM</th>
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<th>LIQUID</th>
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**PUMP TYPE**

Cutter-Type - Sewage & Wastewater

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**Performance Curve**

**EFF. TOTAL HD.**

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**REMARKS:**

3/14
SPECIAL NOTES FOR VFD OPERATION

The benefits of using Variable Frequency Drives (VFDs) include increased energy savings, improved motor torque and speed control capability and improved motor protection. However, the controls industry has seen motors that have operated for years error free, suddenly fail a few weeks after the installation of an VFD. There are four major categories of problems that can occur in a VFD installation - motor bearing damage, the production of harmonics, resonant frequency, and motor insulation damage.

**Bearing Damage**

The high switching frequency of AC VFD's can generate high frequency current pulses through the bearings. If the energy of these pulses is high enough, metal can transfer from the balls and race to the lubricant (EDM or Electrical Discharge Machining) and cause bearing fluting (a rhythmic pattern on the bearing's race). High frequency bearing current damage is generally associated with higher voltage / higher HP motors and is not usually a problem in typical variable speed pumping applications. VFD operation can also cause bearing damage in another way. Bearings are designed to float on a microscopic film of grease or oil while in operation. In some cases, low rotational speeds will allow the balls and the race to come into contact during operation and accelerate bearing wear. This is more of a problem when the motor has a high radial load (belt drive, etc).

**Harmonics**

Harmonics (noise caused by the high switching frequency of a VFD) affect the power supply side of the drive and all circuits connected to that supply. Its effect can range from annoying hums and flickering lights to more serious problems such as the overheating of wiring and its connected devices to tripped circuit breakers. The simplest method of removing this noise is to use line reactors or harmonic traps on the low voltage side of the site's power transformer.
Resonant Frequency

The resonant frequency or, the frequency at which an object undergoes natural vibration, is often overlooked when applying a VFD in a pumping application. In the VFD environment this is often referred to as the critical speed or critical frequency. At some rotational speed or speeds, one or more of its components will begin to vibrate. This is not a problem when a standard, fixed speed pump is employed. If resonance occurred at its design speed, it would have been detected and eliminated during the testing phase. When that same pump is used in a variable speed application, however, it could exhibit vibration at speeds above or below its nominal fixed speed. It is difficult to predict whether a particular pump will exhibit resonance over the speed range it encounters during variable frequency operation. There is, however, a simple way of testing for resonance and avoiding it, if it occurs. With the VFD in manual mode, simply scroll through each frequency value from the lowest to the highest (for example 30 through 60 hertz). Let the pump run at each frequency for five seconds or so. If a resonate frequency is encountered, noticeable vibration will occur. You might also find that vibration may not be limited to a single hertz, but occurs over a range (say 33 to 35 hertz). Once these critical speeds or speed ranges have been determined, the drive can be programmed to bypass them. Although the pump will still pass through these points, it will not remain there long enough to cause vibration.

Insulation Stress & Damage

By far, the most common problem we see in VFD installations is that of Insulation stress, and the damage that results from that stress. This can be broken down into two general categories -- thermal stress and voltage spikes. Excess heat (thermal stress) can be generated by several conditions. The easiest way to reduce or eliminate insulation stress due to heat, regardless of its cause, is to utilize a motor with a higher grade of insulation. Class B can withstand temperatures of 266 degrees F, while Class F is rated at 311 degrees F. Class H, can handle temperatures up to 356 degrees F. If heat is a concern, upgrade to a higher grade of insulation. Voltage spikes present quite a different problem. This appears to be the most common mode of failure. Although they may cause an overall rise in operating temperature, their main contribution to insulation stress is their ability to cause a small breakdown in the air filled voids that form when the insulation is applied. These repeated breakdowns will eventually destroy the insulation. Another phenomenon caused by voltage spikes is known as a corona discharge. A corona discharge ionizes the air between the windings and the highly reactive ions that are formed can cause insulation to deteriorate over time. This type of discharge occurs more often in hot, humid environments.

So, what exactly causes these voltage spikes to occur during VFD operation? They can be due one or any combination of three different conditions:

Voltage Overshoot is a function of the energy stored in the leads during the rise time of each output voltage pulse. The amount of inductance is a function of the lead length
used between the motor and the VFD. Inductance increases the amount of time it takes to charge the capacitance of the motor, which increases the amount of energy in the leads. Voltage overshoot can be 10-20% greater than peak voltage. On a typical 460V motor, this can relate to 1500V, 80% of which is distributed across the first winding of the motor and causes either a phase-to-phase short, or a phase-to-stator short.

*Reflected Voltage* occurs when a wave travels down a transmission line and is reflected back and combines with the incoming wave (similar to ripples traveling across a pond that strike a barrier). This reflection is caused by the difference between the line and load (motor) impedance. If they are the same there is no reflection. If there is a large difference, the amplitude of the reflected wave will approach that of the original wave. Under certain conditions the reflected wave will combine with the original wave resulting in a much higher voltage at the motor.

*Ringing* is the result of the capacitance and inductance of the cable, motor, and the output circuit of the VFD. Together they can create a resonant circuit that can cause the edges of the voltage circuit to assume an undamped ringing waveform. When combined with reflection, ringing can result in voltage peaks at the motor of *two to three times* the normal peak voltage.

Please follow these guidelines to eliminate or reduce potential problems when utilizing a VFD with your Tsurumi pump:

1) Keep the VFD frequency between 30Hz and 57.5Hz. Speeds lower than 30Hz can cause the pump to run so slow that the water being pumped cannot properly cool the motor. Speeds over 57.5Hz can cause motor damage due to the increase of current and temperature by up to 10% and 21% respectively when using a VFD.
2) Remove circle thermal protector. When a thermal protector cools and restarts the pump after a thermal fault, it does not go through the VFDs soft start cycle, and the high starting amperage can quickly damage the motor and/or drive.
3) Do not attempt to touch a pump running under water that is on a VFD. There is a higher risk of a shock hazard when a VFD is utilized.
4) Separate the leak sensor control cable and other instrumentation cables from the motor phase wires to avoid radiated noise issues.
5) On a pump being operated at 400+ volts, utilize an output reactor or dv/dt filter between the VFD and the pump. Generally voltage spikes don’t present a problem in 230V VFD applications due to that standard NEMA motors are designed to operate at 600V continuously and withstand intermittent voltage spikes of 1000V. If a spike were three times normal peak voltage on a 230V motor, it would still be within the 1000V limit.
H-00027-1 Precautions to be taken when operating pumps with a VFD

With the recent wide-spread uses of VFDs, the cases of operating pumps with a variable speed have been greatly increased. The purposes and merits of using VFDs with the pumps are:

- To control the pressure and/or flow rate (saving energy).
- To obtain automatic constant flow rate or pressure (automatic equalization).

However, we must pay attention to the following to prevent unexpected problems.

1. Reduce pump load

   Reason:
   Compared to commercial power supply, the power provided through a VFD will increase the FLA running current by 10% and motor operating temperature will increase by 21%.

   A result of this temperature rise is that the life span of a motor can decrease by half, if the temperature rise is 10°C over the designed value. It is necessary to take countermeasures against this.

   **Method to prevent the problem:**

   It is because of this temperature rise that we recommend running the pumps at no more than 57.5 Hz when operating on a VFD. (48 Hz for a 50 Hz pump). Keep in mind that this will decrease the operating flow to 96%, and operating head to 92% of standard performance curve values.

VIP

Mark Hz is 57.5 Hz
Engineer at Tsurumi said this is not a problem because we are 230V, not 480.

OK, Pumps utilizing a Circle Thermal Protector (CTP) may damage the VFD.

Reason:
When a circle thermal protector trips, for any reason, it does not transmit any signal back to the VFD. The VFD continues to supply power to the motor. When the CTP cools and automatically resets, the motor absorbs its starting current, which is typically 5-6 times the rated FLA current. The maximum current that a typical VFD can withstand is 200% for 0.5 seconds.

Method to prevent the problem:
Remove the circle thermal protector and connect all three lead wires together. If a motor protector circuit is necessary, miniature protectors should be installed in series through each winding, with connections running back to the control panel.


Reason:
A VFD switches output voltage at a high rate of speed and generates a substantially sinusoidal waveform. This far too easily lets the motor generate an induced voltage to the motor frame, and this increases the chance of electrical shock unless the secure grounding has been performed.

Method to reduce Incident:
During pump operation, touching the pump or the peripheral device(s) must be avoided. Confirm And absolutely perform the grounding works for both of the pump control panel and the inverter in compliance with your local electrical standards or your internal wiring codes.
6) Keep the length of cable between the pump and VFD to a minimum. The length of the pumps standard power cord or shorter is recommended. If a cable run between the VFD and a standard motor exceeds 25 feet, a load reactor or dv/dt filter is recommended, especially in 460V applications. If a longer cable is required, an appropriate VFD rated cable can carefully be spliced and separated in a junction box but special attention should be paid to the cable’s insulation type, impedance, and shield/ground system. Cables employing a heavy wall of thermoset insulation are recommended because of the proven electrical benefits and improved high temperature stability that they exhibit. Shielding systems including: copper tape, combination foil/braid, and continuous armoring types are the most appropriate. When VFD cables are installed in close proximity to low-level communications cables and other susceptible devices, shielded instrumentation cable should be used. The use of THHN building wire in conduit has been shown to have detrimental effects to a motor running on a VFD. Also, PVC-Nylon insulated, PVC jacketed, tray cables are the most commonly installed industrial control cable and are often misapplied for use in VFD applications. In some situations, it is possible to create a condition where the VFD may protect itself on a Ground Fault or Over Current Fault. This can occur in situations where multiple cable runs are in close proximity to one another and are not properly shielded. Passing current down one wire lead can induce a voltage as well as a current flow in the wire leads in close proximity to that wire. Having multiple leads in relatively close proximity to one another can set up a condition where unequal voltages and currents can be induced in separate phases per drive; the result could be a Ground Fault.
Existing Control Panel
8' deep
24"

Explosion Proof Box

Cable Tray
6" out

New Conduit to Wetwell
2 (3"

Concrete Floor

2 separate conduits for (2) pumps;
Existing Control Panel
To be replaced

Main Panel
To remain

Sub panel
To remain
(2) 2" conduits to wet cell

New Explosion Proof Box

Control panel to be removed

Cable Tray
For the TOS80C23.7 pumps in a duplex system, I would recommend using the TDVFD-7.5. It’s not listed on the page, but it would be used for a 5hp cutter to handle the extra starting current required for a cutter pump.

Please contact your local distributor for pricing and delivery.

If there are any questions, please let me know.

Regards,

Mike Klimes
Applications Engineer
TSURUMI (AMERICA), INC.
1625 Fullerton Court
Glendale Heights, IL 60139
Phone (630) 547-2252
Fax (630) 793-0146
mikek@tsurumiamerica.com
www.tsurumipumpstore.com
PLEASE

IT IS A REQUIREMENT OF THIS BID THAT EACH PROPOSAL SUBMITTED MUST HAVE A DUPLICATE COPY ATTACHED.

YOUR COOPERATION IS APPRECIATED
TOWN OF WATERTOWN

PROPOSAL

Winding Brook Sewer Pump Station #2 PLC & VFD Control System Specifications and Request for Proposal

Firm

Name

Street

City          State          Zip

Name

Please Print

Telephone Number

Fax Number

Email:

Signed         Date

Cost Complete per Specifications: $__________________________
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