

# PROCESS ENGINEER IV JOB ANALYSIS SUMMARY WORKSHEET

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## **This is an Actual Workshop Deliverable!**

The following is an actual example of a document created in the Competency Centered Interviewing program by the managers who attended the workshop. This information was then used to create an effective interviewing system including detailed and in-depth questions that would be asked of all candidates.

The difference between Knowledge Source programs and traditional training programs is real knowledge that can be applied.

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## ONE: THE BIG PICTURE - KEYS TO SUCCESS

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Success Characteristic	Supporting Behaviors?
1. Problem solving / troubleshooting ability	<ul style="list-style-type: none"> <li>Analytical approach with details knowledge of Semiconductor processes</li> </ul>
2. Flexible schedule	<ul style="list-style-type: none"> <li>Willing to work late, or travel to distant locations</li> </ul>
3. Interpersonal Skills	<ul style="list-style-type: none"> <li>Ability to work well with others under stressful conditions. Know how to give and take with customers and factory.</li> </ul>
4. Detail orientated	<ul style="list-style-type: none"> <li>Communication skills (written and verbal)</li> <li>Note taking</li> <li>Reports</li> <li>Presentations skills</li> </ul>
5. Goal orientated	<ul style="list-style-type: none"> <li>Planning</li> <li>Breaking apart large projects into several distinct pieces (creating milestones)</li> <li>Organized</li> </ul>
6. Inquisitive	<ul style="list-style-type: none"> <li>Good listener</li> <li>Pays attention</li> <li>Able to describe (verbally or written) issue accurately</li> <li>Asks a lot of questions</li> <li>Desire to make process better (high throughput, lower cost, easier to operate, etc.)</li> </ul>
7. Have a clear understanding of the technology to be able to optimize the process.	<ul style="list-style-type: none"> <li>Know what the ideal process is.</li> <li>Goal oriented to meet specs.</li> </ul>
8. Excellent troubleshooting skills of both process and hardware.	<ul style="list-style-type: none"> <li>Systematic approach.</li> <li>Partitioning mentality</li> </ul>

	<ul style="list-style-type: none"> <li>• High understanding of how hardware affects process parameters.</li> </ul>
9. Clearly able to document all experiments, data, and results.	<ul style="list-style-type: none"> <li>• Procedures</li> <li>• Lab notes, run sheets, parameter lists</li> <li>• Experimental data binders</li> <li>• Reports/Presentations</li> </ul>
10. Ability to convincingly present solutions to difficult problems.	<ul style="list-style-type: none"> <li>• Previous presentations, such as for graduate school or in work.</li> <li>• Be organized, think and speak logically.</li> </ul>
11. Ability to successfully complete development projects with duration of 3-6 months.	<ul style="list-style-type: none"> <li>• Previous development experience.</li> <li>• Planning skills, identify milestones.</li> <li>• Understand key points vs. details.</li> </ul>
12. Ability to perform in peak condition when travelling or moving from one project to another: Multi-tasking.	<ul style="list-style-type: none"> <li>• Flexibility in current job</li> <li>• Multiple interests,</li> <li>• Travel or change of life experience.</li> </ul>
13. Analytical thinking	<ul style="list-style-type: none"> <li>• Describe the problem</li> <li>• Research background</li> <li>• Build hypothesis</li> <li>• Design experiments</li> </ul>
14. Planning	<ul style="list-style-type: none"> <li>• Judge duration required for :</li> <li>• 1-hardware setup</li> <li>• 2-experimentation</li> <li>• 3-Get others involved</li> <li>• Write project timeline</li> </ul>
15. Ability to draw conclusions	<ul style="list-style-type: none"> <li>• Summarize data</li> <li>• Search for answers to hypothesis</li> <li>• Propose solution or further work</li> </ul>
16. Scientific & analytical way of understanding and problem solving planning for a given problem.	<ul style="list-style-type: none"> <li>• Complete documenting &amp; recording.</li> <li>• Organized analysis.</li> <li>• Correct DOE building and testing.</li> </ul>
17. Excellent collaboration with colleagues and customers for the	<ul style="list-style-type: none"> <li>• Relationship building based on mutual trust.</li> </ul>

enhanced synergy effect.	<ul style="list-style-type: none"> <li>• Effective information sharing and constructive suggestion.</li> </ul>
18. Capability of predicting future process path.	<ul style="list-style-type: none"> <li>• Researching for the trend of future semiconductor industry.</li> <li>• Productive Communication with experts in this field.</li> </ul>
19. Positive attitude	<ul style="list-style-type: none"> <li>• Enthusiastic</li> <li>• Has demonstrated the ability to learn and to succeed</li> <li>• Punctual</li> <li>• Reliable</li> </ul>
20. Critical thinker	<ul style="list-style-type: none"> <li>• Apply basic principles and reason to solve problems</li> <li>• Able to develop and integrate an effective solution</li> </ul>
21. Excellent communication skills	<ul style="list-style-type: none"> <li>• Ability to work with others</li> <li>• Ability to resolve conflicts</li> </ul>

## TWO: MOST IMPORTANT TECHNICAL COMPETENCIES

Technical Skills	Enabling Behaviors/Knowledge
1. Semiconductor Process Knowledge	<ul style="list-style-type: none"> <li>§ BS, MS, PHD in Chem E, Physics or EE</li> <li>§ Experience at S/C or Equipment Co</li> <li>§ Papers, Presentations, patents</li> </ul>
2. Process Integration	<ul style="list-style-type: none"> <li>§ Experience developing processes</li> <li>§ Understanding design / process interactions</li> </ul>
3. Film Characterization	<ul style="list-style-type: none"> <li>§ Optical properties</li> <li>§ Electrical properties</li> <li>§ Device physics</li> <li>§ Analysis techniques</li> </ul>
4. Statistical process Control, Design of Experiments Analysis	<ul style="list-style-type: none"> <li>§ Training in statistical methods</li> <li>§ Use of DOE software/methods</li> </ul>
5. Specific Novellus system knowledge	<ul style="list-style-type: none"> <li>§ Familiar with ABC hardware</li> <li>§ Software</li> <li>§ Processes</li> </ul>
6. Computer Literate	<ul style="list-style-type: none"> <li>§ All desktop programs</li> <li>§ Process modeling</li> </ul>
7. Process sustaining	<ul style="list-style-type: none"> <li>§ Statistical process control</li> <li>§ “Hands-on” engineering</li> <li>§ Pays attention to details</li> <li>§ Cause/effect analysis</li> <li>§ Focused on the issue</li> </ul>

<p>8. Process development</p>	<ul style="list-style-type: none"> <li>§ Design of experiments (screening, 2-level factorial, response surface)</li> <li>§ Ability to think outside of box – being creative</li> <li>§ Plan – Do – Study – Act</li> <li>§ Increasing knowledge through experiments</li> <li>§ Goal setting</li> <li>§ Planning</li> </ul>
<p>9. Process improvement</p>	<ul style="list-style-type: none"> <li>§ Design of experiments (screening, 2-level factorials)</li> <li>§ Statistical analysis (t-test, F-tests, comparison of means, discrete and continuous distributions, etc.)</li> <li>§ Not accepting “status quo”</li> <li>§ Cause/effect analysis</li> <li>§ Planning</li> </ul>
<p>10. Process integration</p>	<ul style="list-style-type: none"> <li>§ Device physics</li> <li>§ Knowledge of unit processes</li> <li>§ Willingness to further improve oneself through continuous education (seminars, training, advanced degrees, etc.)</li> </ul>
<p>11. Experimental design to be able to partition single parameter responses.</p>	<ul style="list-style-type: none"> <li>§ Able to identify critical parameters</li> <li>§ Design all possible combinations</li> <li>§ Clearly define combinations such that responses are partitioned to single variables.</li> </ul>
<p>12. Experimental design/statistical DOE ability to map out parameter space.</p>	<ul style="list-style-type: none"> <li>§ Familiar with JMP, Stat-Ease or other DOE software</li> <li>§ Able to decipher good fit models from software</li> </ul>
<p>13. Basic understanding of plasma physics.</p>	<ul style="list-style-type: none"> <li>§ How does plasma work</li> <li>§ What influences plasma stability</li> </ul>
<p>14. Competent in typical thin film metrology.</p>	<ul style="list-style-type: none"> <li>§ Use of Rs thickness, stress, particle metrology tools</li> </ul>
<p>15. Experience in particulate control and troubleshooting.</p>	<ul style="list-style-type: none"> <li>§ Slow systematic approach</li> <li>§ Partitioning technique</li> </ul>

16. Perform Experiments	<ul style="list-style-type: none"> <li>§ Process wafers</li> <li>§ Measure results</li> <li>§ Reduce data to key points</li> </ul>
17. Support Escalations	<ul style="list-style-type: none"> <li>§ Problem statement</li> <li>§ Segment problem</li> <li>§ Process-Equipment knowledge</li> <li>§ Designed Experiments.</li> </ul>
18. Documentation Skills	<ul style="list-style-type: none"> <li>§ Write Patents</li> <li>§ Publish BKMs</li> <li>§ Write technical papers</li> <li>§ Weekly reports, internal presentations.</li> </ul>
19. Eval tool acceptance	<ul style="list-style-type: none"> <li>§ Process Knowledge</li> <li>§ Integration knowledge.</li> <li>§ Negotiation skills</li> </ul>
20. Manage customer expectations	<ul style="list-style-type: none"> <li>§ Negotiation skills</li> <li>§ Sales, skills</li> <li>§ Working with difficult personalities, corporate cultures.</li> </ul>
21. Ability to develop new processes	<ul style="list-style-type: none"> <li>§ Knowledge of literature search</li> <li>§ Knowledge of principles of plasma</li> <li>§ Knowledge of vacuum system fundamentals</li> </ul>
22. Ability to solve process problems	<ul style="list-style-type: none"> <li>§ Knowledge of experimental design methodologies</li> <li>§ Knowledge of thin film parameter measurement tools</li> <li>§ Knowledge of data analysis software</li> </ul>
23. Ability to give technical presentations	<ul style="list-style-type: none"> <li>§ Experience in technical presentations</li> <li>§</li> </ul>
24. Ability to meet project deadlines	<ul style="list-style-type: none"> <li>§ Knowledge of project management tools</li> <li>§ Experience in finishing a project within deadline.</li> </ul>

<p>25. Ability to work in a clean room environment</p>	<ul style="list-style-type: none"> <li>§ Knowledge of clean room procedures</li> <li>§ Knowledge of wafer handling procedures</li> </ul>
<p>26. Analytical skills for thin film characterization.</p>	<ul style="list-style-type: none"> <li>• Studying basic concept of characterization.</li> <li>• Actual experience of operating various characterization tools.</li> </ul>
<p>27. Understanding of UHV (Ultra High Vacuum) process.</p>	<ul style="list-style-type: none"> <li>• Studying theories of various vacuum pumps and hand-on experience.</li> </ul>
<p>28. Thin film process knowledge.</p>	<ul style="list-style-type: none"> <li>• Reading related materials.</li> <li>• Participating in experimental tests for various thin film processes in fab.</li> </ul>
<p>29. IC fabrication process knowledge.</p>	<ul style="list-style-type: none"> <li>• Participating in equipment shows like Semicon for understanding of different functions of various tools.</li> <li>• Co-working and discussion with experts for the IC fabrication processes.</li> </ul>
<p>30. Research and develop semiconductor manufacturing processes</p>	<ul style="list-style-type: none"> <li>§ Knowledge of materials science</li> <li>§ Organized</li> <li>§ Good research and record keeping skills</li> <li>§ Understanding of DOE methodology</li> </ul>
<p>31. Process qualification and support at customer level</p>	<ul style="list-style-type: none"> <li>§ Basic understanding of IC design and manufacturing</li> </ul>
<p>32. Operate and trouble shoot various thin film deposition systems</p>	<ul style="list-style-type: none"> <li>§ Experience in PVD/CVD technology</li> <li>§ Experience with vacuums systems and plasma processing</li> </ul>
<p>33. Modify existing software code to develop new processes</p>	<ul style="list-style-type: none"> <li>§ Basic programming skills</li> <li>§</li> </ul>



## **THREE: MOST IMPORTANT PERFORMANCE COMPETENCIES**

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The number preceding each competency is the number out of 7 managers that identified it as most important

### **A. Intellectual Characteristics**

#### **6 ABILITY TO LEARN**

*Determine the applicant's ability to assimilate and apply, in a timely manner, new job-related information that may vary in complexity. To what degree is the individual aware of how he or she learns best and the techniques to use to acquire information efficiently.*

#### **5 ANALYTICAL SKILLS**

*Determine the applicant's ability to secure relevant information and identify key issues, the underlying source of a problem, facts and interrelationships about a problem. How able are they to relate and compare data from different sources, and identify cause-effect relationships?*

#### **5 PROBLEM SOLVING**

*Determine the applicant's ability to understand issues and underlying problems from the other side's (or customer's) perspective. Do they know how to gather all the relevant information? To what degree can they develop a mutually acceptable agreement to a plan or action after review of alternative courses of action? Do they make logical assumptions that take into consideration the other person's perspective, needs and values.*

#### **3 JUDGMENT**

*Determine the applicant's ability to reach logical conclusions based on the information at hand. Can they commit to appropriate action after considering alternative courses of action based on logical assumptions and factual information. Takes into consideration all relevant factors, such as constraints, resources, impact, and values.*

### **B. Personal Characteristics**

#### **5 DRIVE AND MOTIVATION**

*Determine the applicant's ability to perform and push themselves and others for results, particularly in difficult situations. To what degree are they willing to put in the extra effort to get a job done. Look for a high congruence of intrinsic needs with those of the job situation.*

#### **4 GOAL DIRECTED**

*Determine the ability of the applicant to pursue difficult goals and meet them. To what degree are they intrinsically driven to success?*

#### **4 INITIATIVE**

*Determine how often this person makes active attempts to influence events to achieve goals. To what degree is this person self-starting rather than accepting a problem passively; taking action to achieve goals beyond what is required.*

#### **4 SELF ORGANIZED**

*Determine the ability of applicant to organize self, their time and work and follow the plans set. Sets priorities and establishes a course of action for self and others to accomplish specific goals; milestones and activities to get everything done.*

#### **3 ADAPTABILITY**

*Determine the applicant's ability to maintain effectiveness in varying work environments and with different tasks, responsibilities, and people. How comfortable are they with change and what makes this person able to adjust to new work rules, procedures and environments.*

### **C. INTERPERSONAL CHARACTERISTICS**

#### **7 COMMUNICATION - ORAL**

*Assess the ability of this person to clearly express ideas orally in a way that they are understood by others. Does this person know how to clearly and concisely express their ideas and thoughts to others? To what degree does the applicant see communication as a two way process? How do they get feedback to ensure that the message was understood?*

#### **5 COMMUNICATION -WRITTEN**

*The ability to clearly express ideas in writing in a way that they are understood by others. To what degree can this person organize their thoughts and express them in a clear and concrete way. Does this person know how to address the needs of the audience they are trying to reach? Do they have an adequate command of the language and style to get the message across?*

### **D. Organizational Characteristics**

#### **4 LEADERSHIP**

*Effectiveness in influencing individuals and groups to accept ideas and accomplish tasks. Persuasive in charting new directions when needed. Ability to inspire the respect and trust of others to a vision of the possible. How well can this person motivate others toward their goals.*

#### **3 GOAL SETTING**

*Determine the applicant's ability to use goals and objectives to manage others. How skillful are they at using this as a process for involvement and motivation. How experienced are they working in environments that make use of extensive goal setting where these are ever changing .*

### **3 MONITORING AND TRACKING**

*Determine the applicant's ability to establish procedures to monitor the results of delegations, assignments, or projects; taking into consideration the skills, knowledge, and experience of the assigned individual and characteristics of the assignment or project.*

### **3 PROJECT SKILLS**

*Determine the applicant's ability and understanding of fundamental skills of project management. Working through others to accomplish milestones and keep the project on schedule and budget. Motivates others and coordinates activities of the parts. Knowing the various steps from planning a project, breaking it into steps, and monitoring and leading it to completion. Able to use project software and other tools.*

### **3 PROGRAM MANAGEMENT**

*Determine the ability of this person to manage an ongoing program, keeping it within budget, schedule and maintaining customer satisfaction. To what degree can this person build a cohesive team across functions? How do they involve and work through others?*

## **E. Fit Characteristics**

### **7 TOLERANCE FOR STRESS**

*Determine how well this person can effectively operate and personally deal with higher levels of stress. To what degree have they worked under constant change before? What kinds of conflicts did this person face? How well do they cope with unclear and conflicting rules and procedures?*

### **5 WORKING LONG HOURS**

*Assess the applicant's ability to sustain long work hours without undesirable side affects.*

### **5 AUTONOMOUS WORK**

*Determine the ability of the interviewee to work independently with little supervision or guidance from others.*

### **4 CONSTANT CHANGE**

*Assess the capacity of this person to thrive in an environment of constant change. Are they able to deal with the uncertainties of change?*

### **3 HIGH WORK STANDARDS**

*Assess the applicant on their ability to set high goals or standards of performance for self, subordinates, others, and the organization; dissatisfaction with average performance; self-imposing standards of excellence rather than having standards imposed by others.*

## **FIVE: WHAT VALUES AND BELIEFS?**

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What values are felt to me most important?

- Integrity
- Dedication
- Patience
- Flexibility
- Sense of Humor
- Intelligence
- The ability and desire to work with customers to resolve specific issues using a Novellus based films.
- The belief that no problem is too difficult to overcome.
- Attention to detail
- Able to defend all data and decisions
- Focused
- Scientific & analytical mind.
- Mutual trust.

## **SIX: FINDING THE GAP WORKSHEET**

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### **A. Gap One - Detecting Exceptional Performers**

Use these to design questions to help identify exceptional performers.

- Worked incredibly hard applying his fundamental understanding of processes. Customer loved his scientific approach and quick results.
- Being very creative.
- Being very persistent and not giving up on long-term problems
- Commitment to customer goals, willing to endure personal discomfort for greater goal, tenacity.
- One step ahead communication of ideas and conclusions and showing initiative to solve the problem
- Logical, analytical, and scientific approach in
- Planning and problem solving.
- Managed his time extremely effectively. Mature and serious.

### **B. Gap Two - Detecting Mishires**

Use these to help you identify people who look good on paper but who may not be able to do the full range of the job.

- Ability to work well in teams others, customers or ABC employees. Did not probe past problems or work history deeply enough in hiring process. Internal references were not entirely accurate and should not be totally relied on.
- Unable to plan out tasks by themselves.
- Thinking independently, initiative, and documenting results and incremental performance. Systematic approach to complicated problem.
- Integrity: Deliberately misleading management
- He was too self-confident for most of issues compared to his performance
- Severely lacked enthusiasm